VOL. XXII, No. 5 MAY, 1940

THE TOOL ENGINEER

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OFFICIAL PUBLICATION: AMERICAN ASTE SOCIETY OF TOOL ENGINEERS

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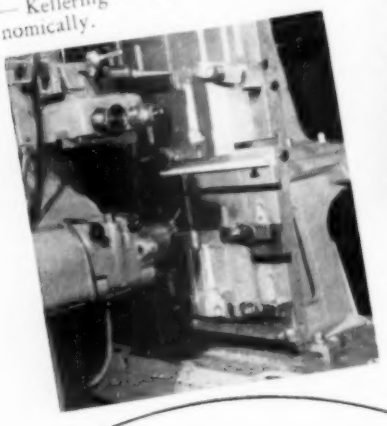
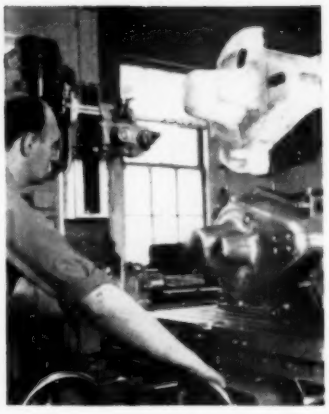
Behind every manufactured product is the tool engineer

DIES

This is a forging die cavity for jet engine impeller blades. P&W Keller Machines cut thousands of forging dies, some simple and some very complex. Tracer-controlled milling — Kellering — does the job economically.



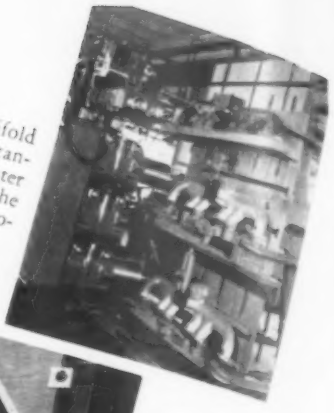


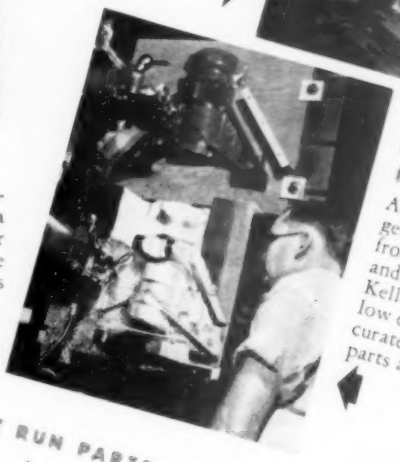
MOLDS

This steel mold for a precision aluminum casting is being cut from a wood master. Plaster or any other readily worked material is suitable for the master form. Plastic molds are made the same way.

PATTERNS

Here are two metal manifold patterns being cut simultaneously from a wood master pattern. Kellering is the quick way to get into production.





EXPERIMENTAL PARTS

An aircraft landing gear part being cut from a solid steel billet and a wood master. Kellering is the fast low cost way to get accurate finished test parts and pilot models.

SHORT RUN PARTS PRODUCTION

An aircraft company needed fifty magnesium wing leading edge segments for a new experimental plane. Angles and shape were complicated but Kellering solved it easily.

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May, 1949

Vol. XXII, No. 5

Editorial

"The Dictionary Says . . ."

THE WORDS "The dictionary says . . ." are indeed familiar as a triumphant note serving to settle for once and for all many subjects under argument. For this reason or that, most of them good, people just aren't inclined to argue with what the dictionary has to say.

Therefore, it is quite in order for us to consider the inclusion of a definition of "tool engineering" in Webster's New Collegiate Dictionary, published April 29, as highly significant. Every so often in the life of a society, such as ours, there occurs some event which is so outstanding as a milestone marking progress that it must be mentioned. Such events are usually the rewards of our labors. And the latest of these is the appearance of an interpretation of our work in a new dictionary.

Their definition reads:

> **Tool Engineering,** a branch of engineering in industry whose function is to plan the processes of manufacture, supply the tools, and integrate the facilities required for producing given products with minimal expenditure of time, labor and materials. **Tool Engineer.***

It is necessarily a brief definition, since the Webster's New Collegiate Dictionary is an abridged dictionary, scaled down for easy desk use.

This, however, does not make it any the less significant. It is one more important step along the path to recognition of the profession of tool engineering which began 18 years ago with the formation of this Society. The authoritativeness of this dictionary is accepted universally. The mere fact of its inclusion in this volume is sufficient to establish the importance of tool engineering in the minds of thousands of people.

And not one among those thousands is likely to know the long story of hours of work that lies behind those few words. They didn't sneak into the dictionary when no one was looking. They were placed there by editors convinced of their worthiness, by editors who have devoted considerable time and thought over a period of more than two years to selecting the best possible words to describe the profession of tool engineering.

It was on the day before Christmas in 1946 that the Society wrote to the publisher, the G. & C. Merriam Co., suggesting that tool engineering be included in its next dictionary. That letter submitted a tentative definition and included a description of the Society and its purpose. It was the first of many letters and proposed definitions, which grew into a thick file of correspondence as the dictionary editors and officers and members of the Society worked to attain an accurate and concise definition.

The thinking of many tool engineers went into this interpretation. As each tentative definition was proposed, arguments to support it were prepared. As a result we have accumulated some valuable additions to the literature of the Society and have added greatly to the interpretation of the role our Society plays in industry.

Broadly speaking, tool engineering is not a new profession. As a process of rational thinking it is antedated only by tribal law. But in the light of the extensive and intensive developments that have paced the rise of mass production, it is new in scope and complexity. Therefore, reducing it in all its variety and ramifications into a few lines of type is indeed a major accomplishment.

While no one claims that this is a perfect definition, it offers an excellent basis for further refinement and expansion for larger dictionaries. And, most important of all, it is highly desirable recognition of the place tool engineering has come to occupy in American life. It is one more achievement in which the American Society of Tool Engineers can justifiably take pride.

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R. B. Douglas

President 1948-49

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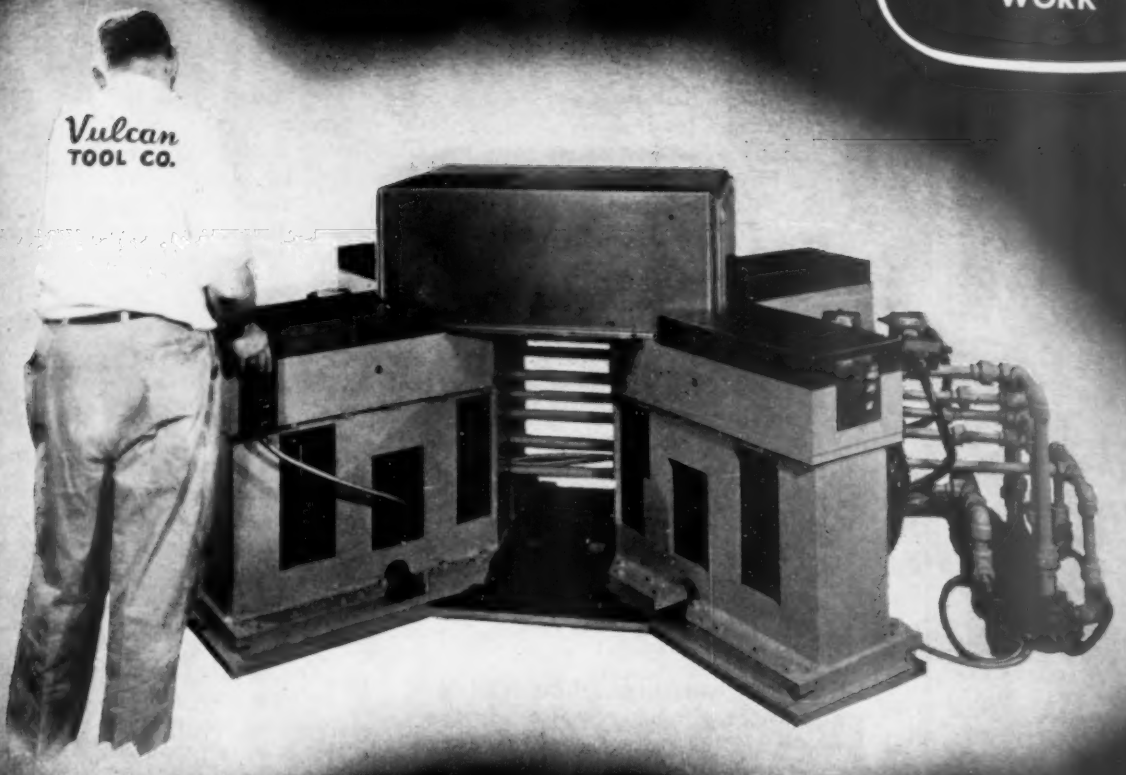
RELEASE PRESSES AND $$ FOR OTHER WORK



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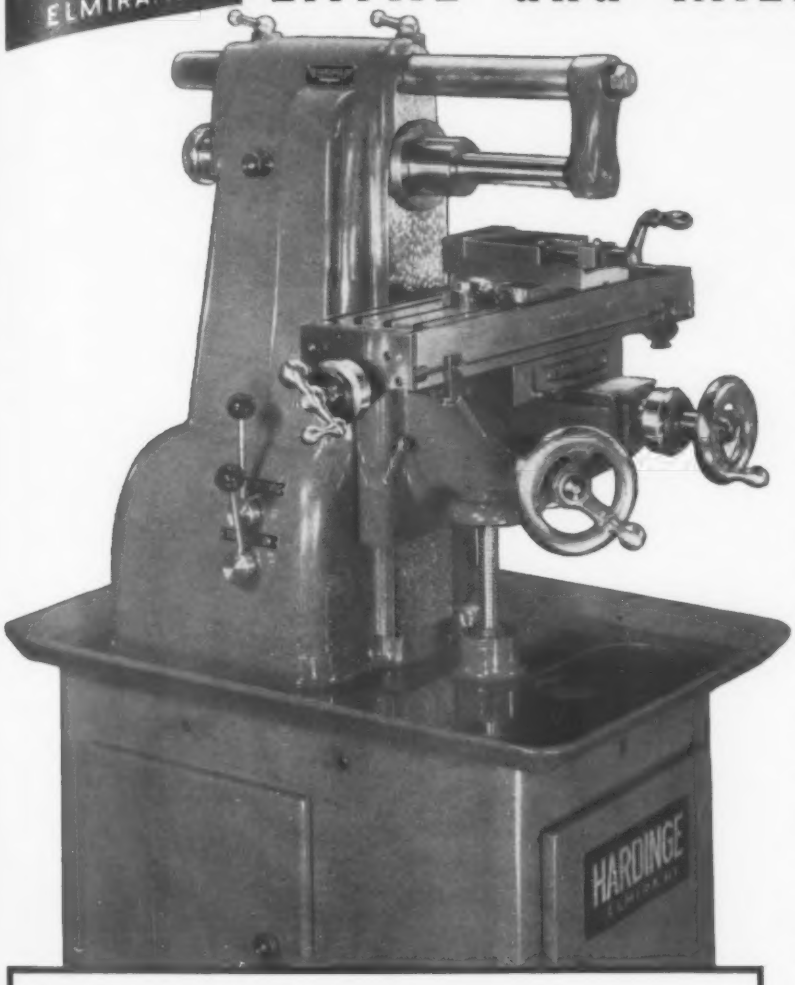

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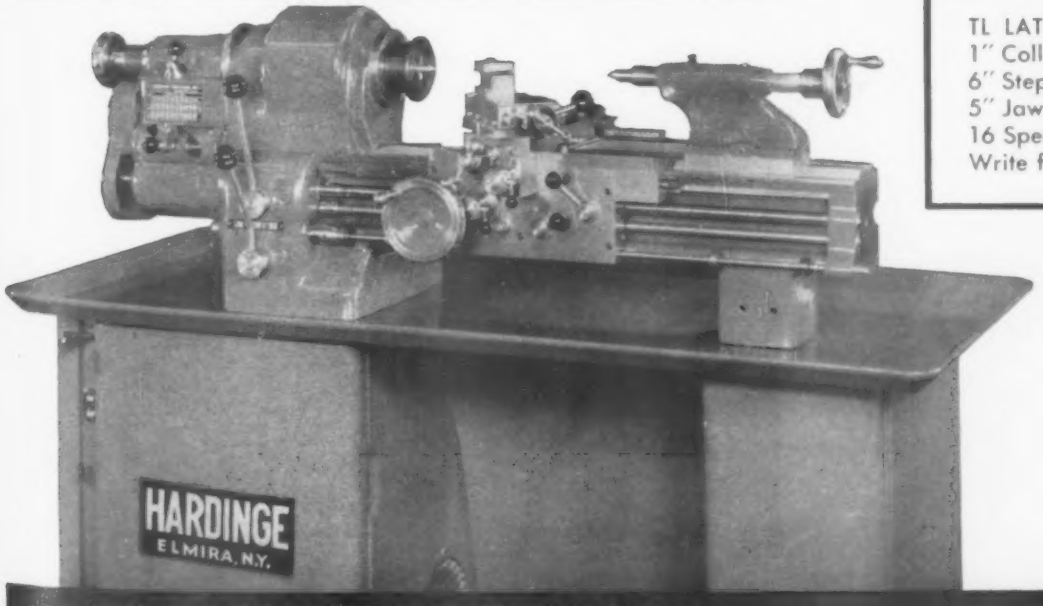

TL LATHE SPECIFICATIONS:
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6" Step Chuck Capacity
5" Jaw Chuck Capacity
16 Speeds Forward & Reverse
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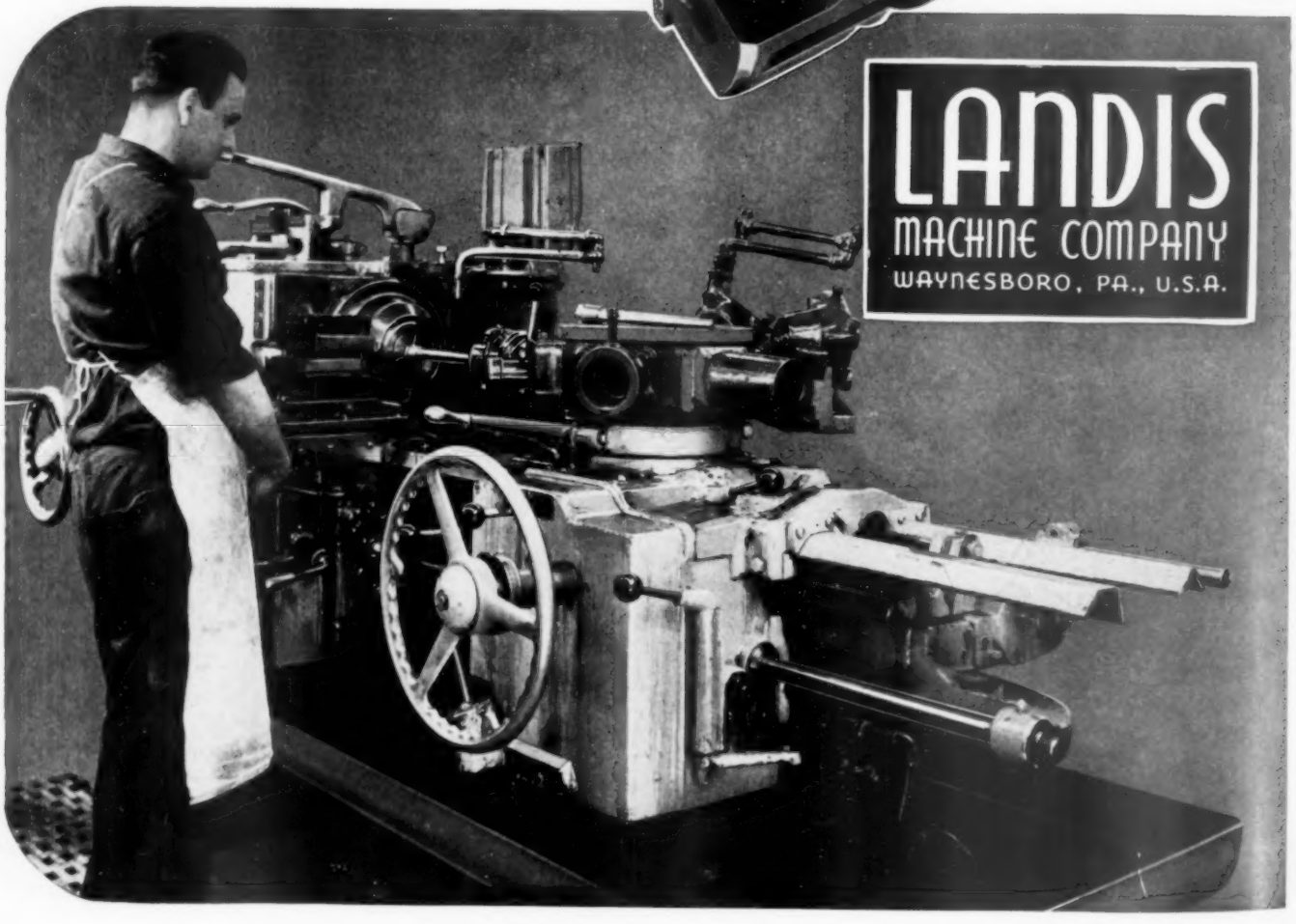

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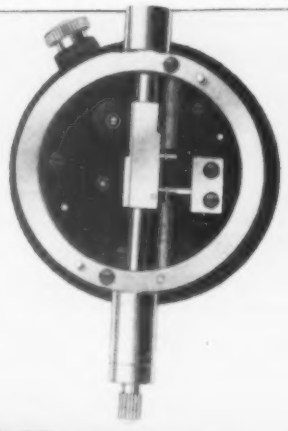

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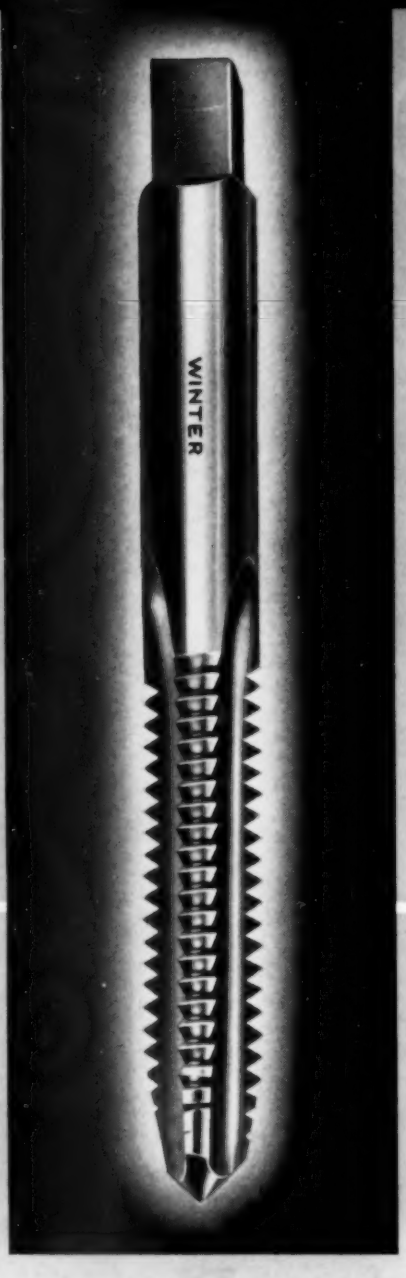

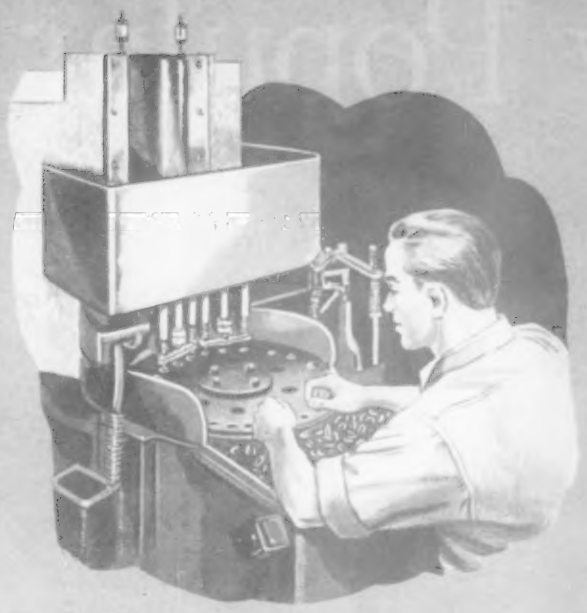

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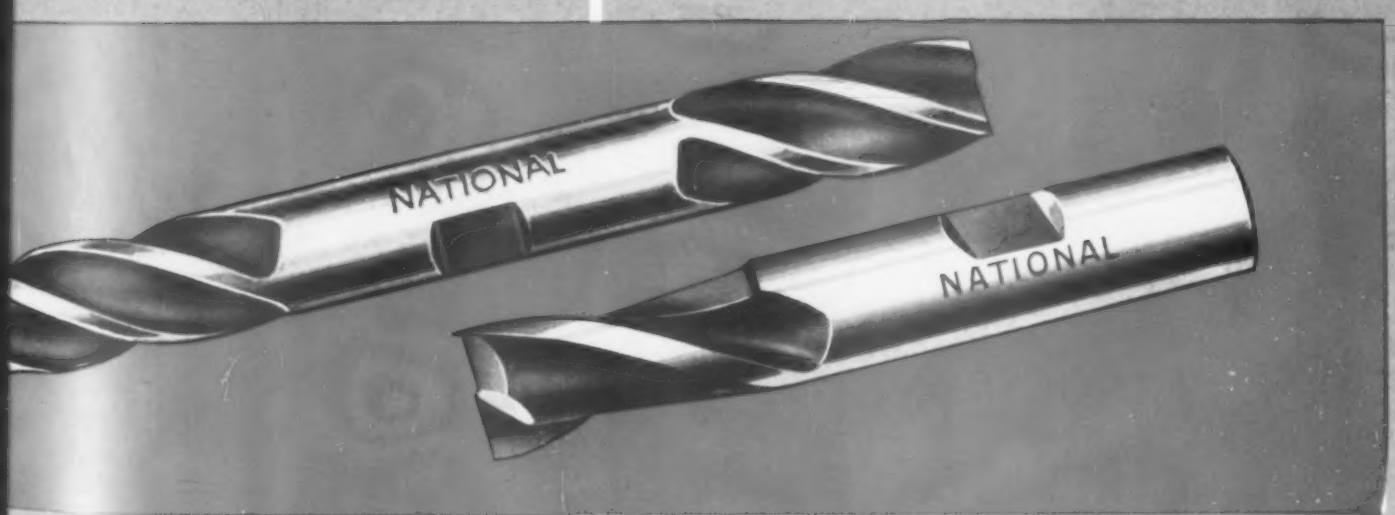

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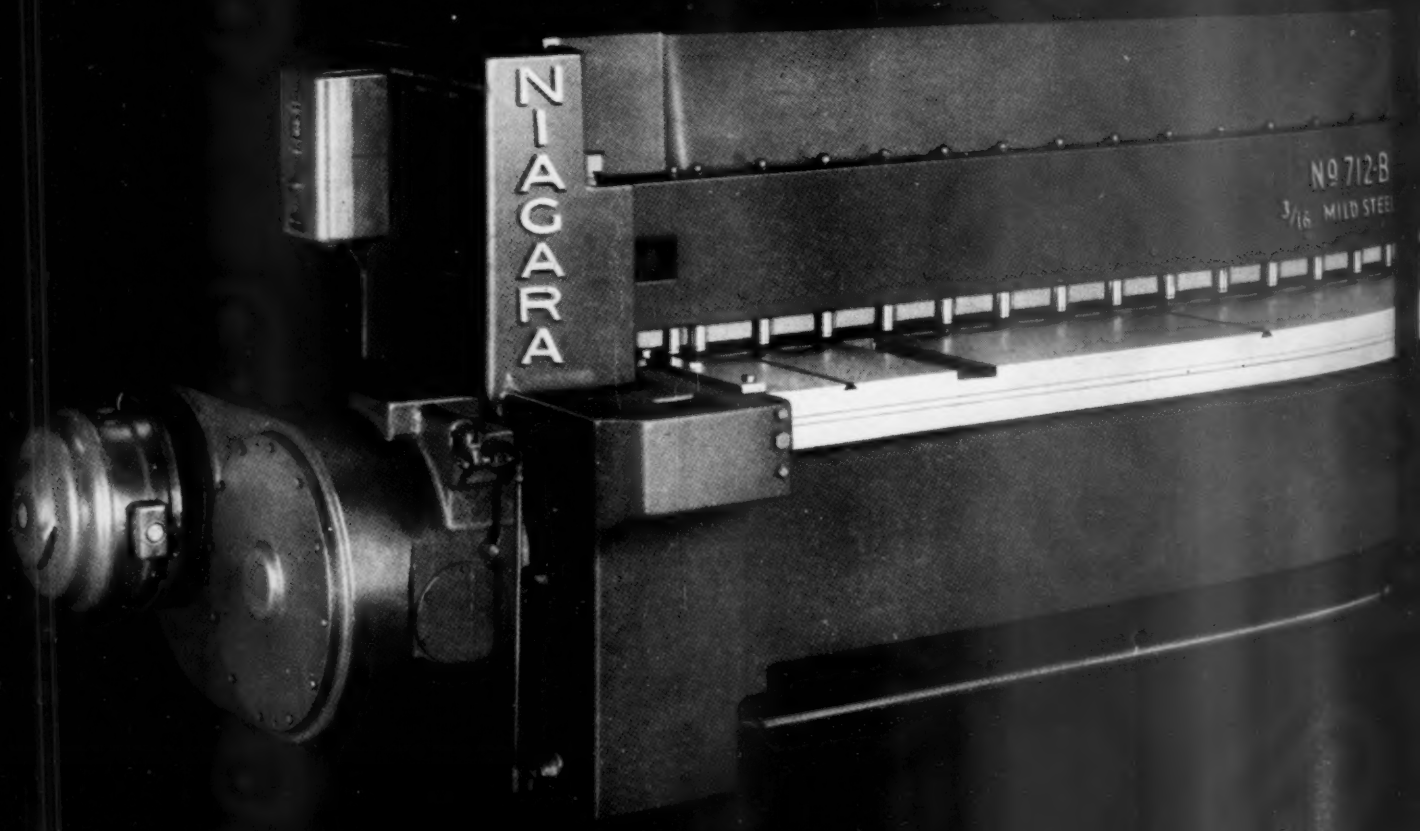

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How does the operator like the new machine? The operator likes the machine very much.
What features appeal to him? Efficient guarding - convenient control locatio

How does the operator like the new machine? The operator is very pleased with the machine
What features appeal to him? Good guarding - easy to clean.

How does the operator like the new machine? Good.
What features appeal to him? Ease of operation - he likes the controls.

How does the operator like the new machine? He is very pleased with this equipment.
What features appeal to him? The controls - easy machine to load.

How does the operator like the new machine? Very good.
What features appeal to him? Ease of cleaning; easy access to tools.

How does the operator like the new machine? Very well and it is not tiresome to work
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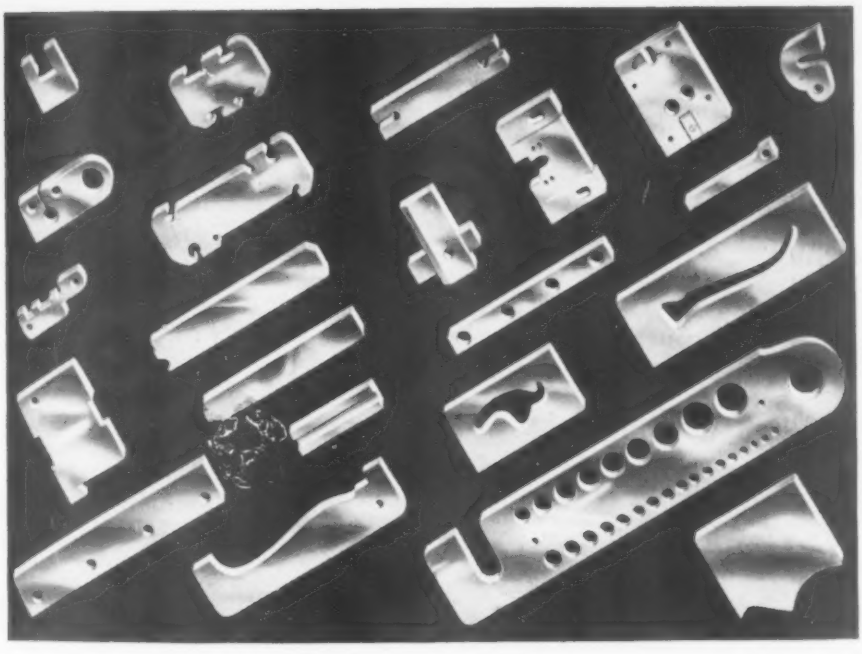

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Abrasive Cut-Off Wheels

Their Selection and Use

By B. G. Ebbeson

NORTON COMPANY

ABRASIVE CUT-OFF wheels have established a definite place for themselves not only in the toolroom, but also on production jobs where work can be cut to length within a few thousandths of an inch with such a high quality of finish and squareness of cut as to eliminate the necessity of a subsequent straddle milling or grinding operation. Other advantages of the abrasive cutting-off tool include the ability to cut readily through any hard spots that may be encountered in the metal, with a corresponding saving in time and labor. These advantages apply to cutting-off steels of practically all analyses, including stainless; as well as to bronze, brass, aluminum alloys, plastics, ceramic, and glass.

Abrasive cutting is performed by dry, wet and submerged methods. There are three general types, (1) chopper type, (2) traverse or horizontal type, and (3) either specials or "home-made" cut-off machines designed to handle more or less special work.

On the popular chopper type cut-off machine, the abrasive wheel is supported by an overhead counterbalanced arm which is raised and lowered either by hand or hydraulically. In one case, the wheel feed and pressure against the work is dependent upon manual control, while in the other the hydraulic feed is set for a predetermined rate. Bar stock up to 2 in. diameter and tubing up to 3½ in. diameter can be cut, either wet or dry, on the chopper type machine.

For wet cutting, rubber wheels are recommended and are generally operated at speeds from 7,500 to 12,000 surface feet per minute. For dry cutting, most chopper type machines run at 16,000 sfpm (max). Durable, resinoid bonded wheels are recommended for dry cutting. On the traverse or horizontal type cut-off machine, the abrasive wheel travels horizontally along the work table. Here the advantages of abrasive cutting can be applied to slabs or plates of both metallic and non-metallic materials. Slitting and slotting of long pieces can be handled readily by the traverse type machine.

Both wet and dry machines of this type are available for operation usually around 12,000 sfpm or lower. It is essential that the initial cut of about 1/16 in. depth across the entire piece of material be made without undue stress on the wheel or machine, to insure a straight cut. Once the "scoring" cut has been made, then the wheel can be fed from 1/16 in. to as much as ⅛ in. per pass, depending upon the hardness of the material.

The broad classification of traverse type cut-off machines might well include the portable type abrasive saws, such as Skilsaw, Stanley, and Black & Decker, and others that are widely used for cutting or scoring brick, tile and concrete.

High Speed, Dry Cutting

Machines for dry cutting are now available in both high and low speed types. The development of heavier and more rigid machines and recent improvements in resinoid bonded

Typical dry, chopper-type abrasive cut-off machine for cutting tubing, angle iron and other sections.

cut-off wheels have combined to make high speed cutting, which implies the operation of the abrasive wheels at speeds as high as 16,000 sfpm, both popular and profitable.

When cutting dry, the peripheral speed is highly important. A wheel running at a speed of 16,000 sfpm is approximately twice as efficient as one operating at only 9,000 or 10,000 sfpm, while decreasing the speed still lower to 4,000 or 5,000 sfpm makes the same wheel only 20 percent to 30 percent as efficient as at 16,000 sfpm.

The chief reason for this wheel behavior when cutting dry is that at the higher speeds the metal being cut becomes heated to such an extent that it is extremely soft, possibly in a near molten state, and thus is easily abraded by the sharp cutting grains of the abrasive wheel. At the lower speeds, on the other hand, much less heat is generated and the abrasive grains must actually shear off the metal as in metal cutting, thereby greatly increasing the work load on the grains which in turn increases the tendency for them to pull away from the bond. The net result is a marked decrease in wheel life, or higher cost per cut.

Much of the success obtained with abrasive cut-off wheels can be attributed to the operator's skillful manipulation of both the abrasive wheel and the machine. For example, the wheel should be fed at its maximum cutting capacity, once this has been determined. An inexperienced operator who does not apply sufficient pressure to prevent the wheel from either glazing or breaking down normally may be responsible for excessive wheel breakages. On the other hand, too rapid a feed will tend to tear the abrasive grains from the bond prematurely, resulting in high wheel cost.

Unfortunately, not many cut-off machines are equipped with variable wheel speeds, with the result that as the wheel wears and becomes smaller in diameter, it is running at a correspondingly less efficient cutting speed. Many plants which have production cutting operations are equipped with machines of two different sizes. With this setup, 16 in. diameter wheels, when new, are operated at high speed (16,000 sfpm) and when worn down a few inches, are placed on smaller high-speed machines that operate 12 or 14 in. diameter wheels at a sufficiently higher rpm to maintain or closely approach the 16,000 sfpm at which the wheels are most efficient.

While rubber bonded wheels are used for dry cutting, (both high and low speed), their application is usually restricted to cutting-off operations where the heat generated is at a minimum. The principal objections to the use of rubber bonded wheels for dry cutting are (a) excessive wheel wear brought about by the softening of the bonding material due to heat, rubber being a thermoplastic material; and (b) the resultant odor given off by the rubber bond. However, high speed rubber wheels are used dry on tubing jobs where any residue of finely powdered metal chips, abrasive and bond which accumulate inside the tubing can be easily removed; and on foundry cut-off machines for cutting nonferrous sprues, gates, and risers where some flexibility in the wheel is essential.

Low Speed, Dry Cutting

Low speed cutting off implies that the abrasive wheels are operated at speeds in the range of 9,000 to 12,000 surface feet per minute, or less than 9,000 sfpm. The majority of the small abrasive cut-off machines in use in toolrooms, as well as specially designed machines for production cutting and the makeshift equipment found in small shops are of the low speed type.

Changing over low speed equipment to high speed is not advisable, unless serious consideration is given to all the factors involved by the vastly greater stresses, and necessary provision is made for safe operation of the wheel at the possibly 33-1/3 percent higher speed (from 12,000 to 16,000 sfpm.)

Abrasive cut-off wheels designed especially for efficient low speed cutting are the shellac bonded type, the softer rubber bonded wheels up to grade R*, and the softer resinoid bonded wheels through grade N*.

Because of their somewhat lower strength, these softer grade wheels should never be used for strictly high speed cutting (16,000 sfpm).

Wet cutting is done on low speed type machines only. The lower wheel speed allows the coolant to reach the point of contact between the wheel and the work and then to be carried through the cut by the wheel.

Wet Cutting

Rubber bonded wheels are usually employed on wet cutting operations. For best results they should be operated at speeds between 7,500 and 12,000 sfpm. At higher speeds, the coolant cannot be retained on the wheel surface in sufficient quantity to prevent excessive heat to be built up in the wheel and the work. The conventional wet cut-off machine employs a coolant box which spreads a copious amount of liquid over the work, wheel face and sides and thereby dissipates the heat normally generated in cutting. The result is a quality cut; any burr which may be produced is light and can be readily removed, or in some cases even washed away in the cutting. Even hardened steels and very brittle materials of large cross section can be cut by this method without altering physical characteristics of the metal.

The effectiveness of this wet cutting method is proved by the fact that this-walled tubing is cut clean, with practically no burr, indicating that the metal is sheared off by the sharp and cool cutting abrasive wheel, rather than pushed off after first being heated to a semi-molten state by the wheel.

The coolant most generally used for wet cutting is plain water, although soluble oil or soda mixed with water is sometimes used to prevent rusting the work or the machine. Special oily grinding fluids are used on relatively soft and ductile metals like aluminum and brass to retard loading of the wheel face.

It is particularly important that the rubber cut-off wheels be used with a uniform flow of coolant on the periphery of the wheel in order that it retain its flatness and proper face. If the coolant is not applied equally to both sides of the wheel, the wheel face will tend to wear to a chisel edge, with one side of greater diameter than the other, or else the edge will become excessively rounded. When this occurs, it

*—in the Norton grade range

is impossible to make a straight or clean cut and as the condition becomes aggravated, wheel breakage may follow. In some instances it has been observed that the coolant was being applied evenly to the sides of the wheel but not close enough to the periphery, with the result the wheel face heated up faster than the sides, causing a concaved wheel face and spalling of the edges.

In wet cutting where discoloration, burr, and finish are factors to be considered, softer grade rubber bonded wheels are widely used. Where there are no stipulations as to finish and quality of cut, wheel life can be greatly increased by going to coarser grit sizes and harder grade wheels; for example, from 80 to 46 grit and from grade T to X (in the Norton system of grading wheels).

In this type of wet cutting, the entire work and the lower part of the wheel are submerged in the coolant. Cuts of highest quality are readily made on such materials as glass rod and tubing, plastics, ceramics, and heat sensitive steels. Metallographic specimens cut by this method require only a slight polish to prepare them for examination.

Rubber bonded type cut-off wheels are recommended for submerged cutting. The speeds found to work best are in the range of 5,000 to 6,000 sfpm. Coolants used are plain water and mixtures of water and soluble oils or soda.

How to Select Cut-Off Wheels

The selection of any cutting-off wheel is, in the final analysis, a compromise between the cost and quality of the cut. In order for a tool engineer to be able to select the best wheel for a given job, he should know what factors influence the choice of specifications and then take these factors into consideration. They are listed as follows:

A. *Type of Cut-off Machine, Wheel Size and Operating Speed*

As has already been pointed out, there are several different types of cut-off machines being made today. It is important to know the make and model number of the machine, wheel size (diameter x thickness x arbor hole), wheel speed, and whether the cut-off operation is to be done wet or dry.

B. *Material and Size of Stock to be Cut*

For cutting-off practically all metals, either wet or dry, aluminum oxide abrasive wheels are used. Silicon carbide abrasive wheels are used for relatively brittle materials, such as glass, brick, porcelain, and in a few cases on nonferrous metals. Hard or brittle materials require softer grade wheels than the tough, ductile materials such as bronze and aluminum alloys.

Larger cross sections require softer grade wheels to provide a free cutting action without overheating the wheel or the work.

C. *Quality of Cut Desired*

Although abrasive wheel cuts are smoother than those made by other methods, definite information as to the quality of cut required is highly desirable since wheels are available that will cut with a minimum amout of burr and freedom from discoloration whereas there are other types that will give much longer wheel life if these factors are of secondary importance.

Tool Room Cutting and Slotting

Cutting stock for making tools and dies, salvaging broken drills and single-point tools by cutting-off the damaged portion and then repointing, grinding chip breakers—all are operations requiring relatively thin organic bonded wheels, either shellac, rubber, or resinoid. The specific choice depends on the relative importance of such factors as speed of cut, whether cutting is to be done wet or dry, and the amount of burr and burn allowable.

Shellac bonded wheels have a characteristic smooth and free cutting action that makes them particularly suited to dry cutting, are also satisfactory and economical to use on tool steels and metallographic specimens. They are somewhat stronger and more durable than shellac bonded wheels and will give almost as good a finish.

Resinoid bonded wheels are recommended for toolroom cutting jobs where long, economical wheel life is the chief consideration and discoloration and burr are secondary. The softer grades, namely, I through L, are recommended for the heat-sensitive tool steels; harder grades, M through P, for the less heat-sensitive steels and other alloys. Recommendations for cutting various materials are presented in Table I.

General Recommendations for Dry Cutting

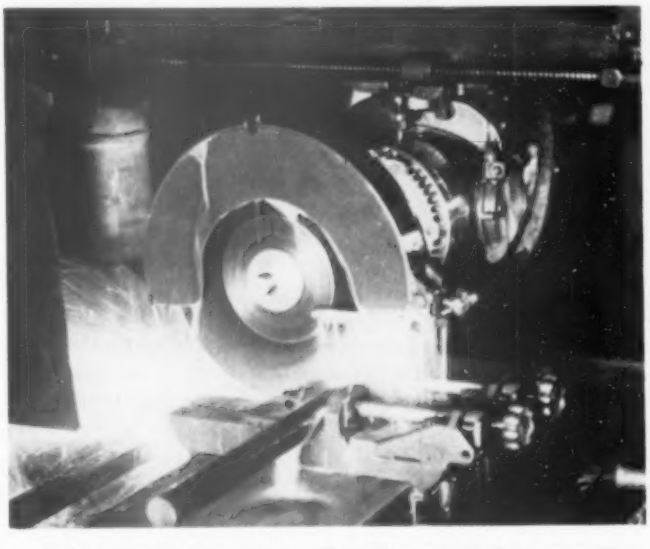
Resinoid bonded cut-off wheels generally give the lowest cost per cut wherever they can be used.

The choice of grit size in the range for metal cutting, namely, 20 through 80, (aluminum oxide abrasive) is dependent on the finish required. In general, the coarser the grit size, the longer the wheel life, but the poorer the finish. The coarser grit sizes are best for the softer, more ductile materials where there is a tendency for the wheel to load. This same consideration governs the general grit size range of 16 through 46 in silicon carbide abrasive for nonmetallics because of excessive loading with the finer grit sizes.

For cutting heat-sensitive steels, grades I through L are recommended; for the less heat-sensitve steels and other metals, grades M through P. Grades Q through V are recommended for the softer metals where economy or long wheel life is of primary importance. In general, softer grades, L through O, are used for the non-metallic materials, the specific grade being dependent largely upon the abrasion resistance offered by the material. For example, asbestos board and transite which load readily and do not tend to dress the cut-off wheel, are cut most effectively with a grade L wheel; a harder grade wheel would lack the necessary breakdown to keep it free cutting.

While rubber bonded wheels are also used to some extent for dry cutting, their application is limited largely to light toolroom cutting in order to produce the desired finish and wheel life, cutting of nonferrous metals in the foundry where some flexibility in the wheel is required to avoid excessive breakage, and on tubing jobs where the residue must be easily removed.

Rubber bonded cut-off wheels give the best results on practically all materials when used wet. This bond type should be used where the area of contact is relatively small,



Wet traverse type abrasive cut-off machine, suitable for cutting off bar stock, tubing and slabs.

TABLE I—TOOLROOM CUTTING RECOMMENDATIONS*

Low carbon steel	A60-04E shellac
Cold rolled steel	A60-ROR-30 rubber
Tool bit stock	A46-08B resinoid
High-speed steel (hardened)	A60-M4E shellac or A60-MOR-30 rubber or A46-L8B resinoid
Cast alloy (Stellite, Rexalloy, Tanting)	A60-M4E shellac or A60-KOR-30 rubber or A60-K8B resinoid
Drills and taps (salvaging)	A60-M4E shellac or A60-MOR-30 rubber or A60-O8B resinoid

excessive heat is not generated and a good finish, with a minimum amount of burr and burn, is desired.

For solid bar stock, grit sizes 36 to 60, aluminum oxide abrasive, are recommended; for steel tubing, 60 to 120 grit, the specific size depending upon the finish and allowable burr. For non-metallics, sizes 60 to 120, silicon carbide abrasive, are recommended for both solid stock and tubing.

For cutting hardened tool and die steels, grades in the soft range such as K, M, P and R are recommended. For cutting solid bar stock and tubing, harder grades, U through X, can be used to advantage. The softer grades will cut faster and give a better finish; harder grades will cut slower but give longer life.

The reinforced resinoid bonded type of cut-off wheel, constructed to withstand considerable side pressure and twisting without danger of breakage and with molded file-like rough sides for side cutting, has in many instances replaced the conventional resinoid and rubber bonded wheels for cutting off nonferrous sprues, gates and risers on foundry cut-off machines. The advantages of this wheel have been extended to portable cut-off machines and to light snagging and deburring operations common to foundries. Specifications of reinforced resinoid cut-off wheels recommended for foundry use are given in Table II.

Cut-off wheels containing crushed diamond particles as the abrasive have been developed for cutting cemented carbides, glass, marble, granite and other stone, and hard ceramics. These wheels, usually made with a steel center, must be used wet, with a copious supply of coolant directed on the wheel and the work, to insure long, economical wheel life and efficient cutting action. Plain water or light oil such as kerosene is generally used for cutting glass; plain water for ceramics and stone.

Summary of Cut-Off Wheel Recommendations

Table III presents average specifications that may be used as a guide in selecting abrasive wheels for cutting any of the materials listed. They are subject to some variation in the grit size and grade, depending upon the type of cut-off machine, wheel speed, size of cross section to be cut and quality of cut desired.

*The recommendations listed are Norton Company's, and are based on the standard system of marking grinding wheels used by most grinding wheel manufacturers. The letter *A* preceding the grit size denotes aluminum oxide abrasive; the letter *C* silicon carbide, the letter *D* diamond abrasive. In the bond type positions, *B* stands for resinoid, *R* for rubber, *E* for shellac.

TABLE II—SPECIFICATIONS OF REINFORCED WHEELS RECOMMENDED FOR FOUNDRY USE

Cutting off	Wheels 14 in. thru 20 in. diameter x 5/32 in. thick
Sprues, gates and risers on bronze, brass, and aluminum castings	(A241-014BN* (A241-R14BN** (A241-V10BN***
	Wheels 3 in. thru 10 in. diameter x 1/8 in. thick
Slotting and deburring cast iron	(37C241-014BN* (A241-R14BN**

TABLE III—SELECTION OF ABRASIVE WHEELS FOR VARIOUS MATERIALS

Material	Dry Cutting	Wet Cutting
Aluminum	A245-Q8B	A46-V8R-30
Bakelite (molded)	37C46-I8B	
Bits (drill)	A245-Q8B	A60-X10R-30
Brake lining	37C30-08B	
Brass (rod)	A30-U7B	A60-V8R-30
Brass (tubing)	A80-V8R-30	A120-V8R-30
Brass (gates and risers)	A24-T6R-29	
Bronze (gates & risers)	A241-R14BN	A24-T6R-29
Cable (steel)	A60-T7B	A60-V8R-30
Carbon (rod)	37C54-N8B	37C54-L8B
Cast iron	A36-P8B	
Cemented Carbides		D100-N100B-1/8
Copper (rod)	A60-V8R-30	A80-V8R-30
Copper (tubing)	A80-V8R-30	A120-B8R-30
Drill rod (soft)	A46-Q8B	A60-X10R-30
Drills (twist, hard)	A245-Q8B	A60-MOR-30
Fibre board	37C46-L8B	
Knives (machine)	A46-P8B	A60-POR-30
Metallographic specimens	A54-I8B	A60-M6R-30
Nickel	A46-Q8B	A60-X10R-30
Pipe (steel)	A30-U7B	A80-U10R-29
Plastics	37C60-N8B	37C90-POR-30
Porcelain (pre-fired)	37C100-J8B	
Rubber (hard)	37C30-M8B	
Rubber hose (steel mesh)	A36-U7B	
Steel (cold rolled, hard)	A245-M8B	A46-V8R-30
Steel (high speed, soft)	A245-Q8B	A46-V8R-30
Steel (low carbon)	A245-Q8B	A46-V8R-30
Steel (high carbon)	A46-R7B	A46-V8R-30
Steel (stainless)	A46-Q8B	A46-V8R-30
Stellite, Rexalloy, Tantung	A46-K8B	A60-KOR-30
Tools (salvage)	A70-08B	A60-ROR-30
Tubing (aluminum)		37C100-U6R-30
Tubing (brass & bronze)	A46-08B	A80-V8R-30
Tubing (steel)	A80-V10R-29	A80-U10R-29

When selecting either resinoid or rubber cut-off wheels, it is well to keep in mind the following facts.

1. When going harder in grade, the wheels are stiffer, more heat resistant and more durable; when going softer in grade, the wheels cut freer, are more flexible but wear faster.

2. For the same grade and structure, a finer grit wheel will act softer (wear faster) than a coarser grit wheel.

*—Softest available grade, freest cutting action, greatest flexibility
**—Medium grade, all-purpose wheel
***—Hardest available grade, least flexible, most durable

First of a series of three articles on resistance welding applications

Design for Resistance Welding

By E. J. Del Vecchio

SWIFT ELECTRIC WELDER CO.

IN ITS SIMPLEST FORM, resistance welding consists of a simultaneous application of electric current and forging pressure to two pieces of metal to be joined. The various forms of resistance welding—spot, projection, seam, butt—are similar in principle, but the equipment required may vary widely in construction and method of operation.

A spot weld, as the name implies, is a weld in a confined area between two (or more) sheets.* Most applications of spot, projection and seam welding involve either a lap joint or a flange, which may be considered as the equivalent of a lap joint.

Fig. 1 shows the elements of a simple spot weld. A-A1 are the two sheets being welded, and E-E1 are the electrodes. From a design standpoint, the only requirement is that sufficient lap (B—Fig. 2) be provided as well as sufficient space in which the electrodes may operate. With these conditions fulfilled, it is relatively simple to either apply a standard machine, or to design a special machine to satisfy production requirements.

Resistance welding is the fastest and least expensive metal fabricating process known to industry, but in order to realize the maximum advantages, the product should be designed specifically for resistance welding. When a product originally designed for riveting or other forms of welding, soldering or brazing is later resistance welded without any design change, the maximum advantages are often not realized.

Fig. 3 illustrates several examples of spot welded joints, and it will be noticed that the elements of lap width, and electrode operating space previously mentioned, appear in all cases. However, not always can the product be designed to suit the best welding requirements. Series and indirect welds may then be used to advantage.

Fig. 4B shows a typical indirect weld. The actual welding electrode is at E, while at E1 is the electrode carrying the return current. Point X may or may not be a current carrying member, depending upon the product, the spot spacing and the machine.

In Fig. 4C is shown a simple form of series welding. E-E1 are the welding electrodes, but in this case, two welds are made simultaneously. If the two upper sheets should be one continuous piece, the welds may still be satisfactory, depending on the gage of the metal and the spot spacing. Spot location is important, since if the spots are too close together, an appreciable portion of the current will pass through the top piece only, leaving insufficient current for the welds. In the event anvil B is a non-conductor, the spacing between the two spots must be four to ten times that for a copper anvil. The ideal spot welding condition is the use of two opposing electrodes as shown in Fig. 1. When both pieces of stock are of equal thickness, the tip diameters at point of contact with the work should be equal. If the stock thicknesses are unequal, the tip diameter should be proportional

* For the sake of simplicity, all references to metal being welded will assume to be clean mild steel, SAE 1010, unless otherwise specified.

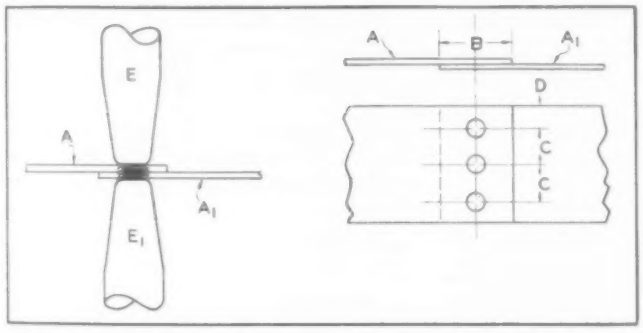


Fig. 1 (top). The elements of a simple spot weld are shown at left, with A-A1 being welded, and E-E1 representing the electrodes.

Fig. 2 (top right) illustrates the lap requirements for a spot weld, and should be consulted in connection with Table I. The stock thickness is shown at A, lap width at B; C illustrates spot spacing, and at D is shown the edge distance.

Fig. 3 (right) presents some typical examples of spot-weld applications. At A is shown one of the most common types of joints; a sheet welded to an angle. Note the ample lap width as well as electrode space. In the joint shown at B, while there is ample room for the lower electrode, the upper electrode is cramped. This can usually be worked out if the electrode angle does not exceed 30 deg from vertical. The application at C is typical of welding two angles together, or a sheet to a channel section. Ordinarily it is necessary for the electrode to clear the flanges or side pieces in loading or unloading, and sometimes it may become a problem due to upper electrode movement. The joint at D is a common one which is apt to give trouble, since both electrodes contact the same piece of metal and therefore results in a considerable part of the current passing through the outside folded piece only, rather than through the joint as intended. If this type is to be used, the current path through the folded-over section should be as long as possible. Shown at E is a joint in which ease or difficulty in welding is a function of electrode space. The gage of the metal permissible in such a joint is proportional to the diameter of the tube. This, in turn, is predicated on the length of the tube through which the elecrode must be supported. In some cases where the inner electrode can be supported physically by an outside backup member (as shown by the dotted lines), it becomes merely a current carrying member.

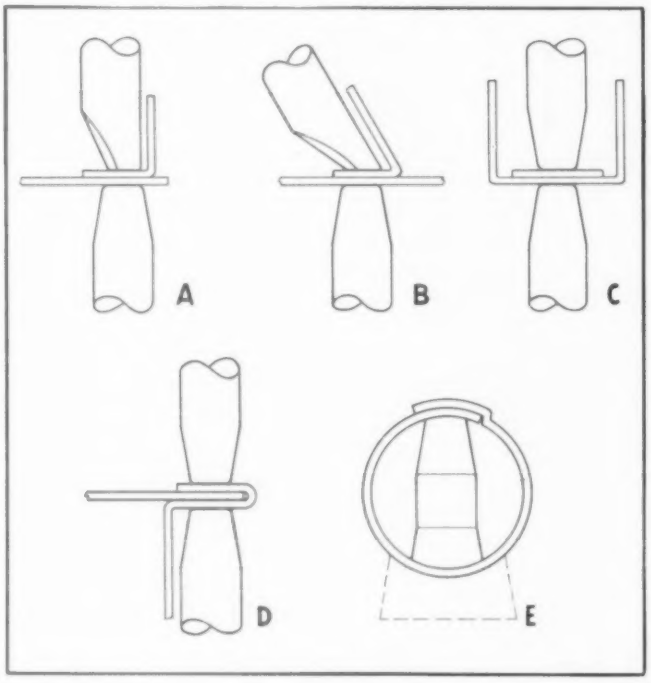


Table I—Elements of Spot Weld Design

1 U.S.S. Gauge	2 Thickness in.	3 Min. Over-Lap—in.	4 Spot Spacing	5 Spot Diam.	6 Spot Strength
32	0.010	3/8	¼	0.100	130
25	0.021	7/16	⅜	0.130	320
22	0.031	7/16	½	0.160	570
20	0.040	1/2	¾	0.190	920
18	0.050	9/16	⅞	0.220	1350
16	0.062	5/8	1	0.250	1850
14	0.078	11/16	1¼	0.290	2700
13	0.094	3/4	1½	0.310	3450
12	0.109	13/16	1⅝	0.320	4150
11	0.125	7/8	1¾	0.330	5000

The table is based on welding two equal thicknesses of clean cold rolled steel, SAE 1010 or equivalent. If unequal thicknesses are used, the values apply to the thinner of the two.
Column 3 is dimension B, Fig. 2. Edge distance, dimension D, Fig. 2, is taken as one half the overlap, Column 3.
Spot spacing, column 4, is the minimum spacing between spots for which no machine adjustment need be made to secure uniform results. If less spacing is used, machine settings of time or current or both must be readjusted after the first spot.
Column 6 shows spot shear strength obtainable on steel of 70,000 lb ultimate strength, when current, time and pressures are properly adjusted. The spot diameter will be approximately the diameter shown in Column 5.

to the thicknesses, and the current-, time-, pressure requirements will be determined by the thinner piece.

It is often desirable to have one side of a spot weld as nearly invisible as possible. In this case, the electrode on the "show" or invisible side should have a very large area. If the stock thicknesses are unequal, it is very difficult for the "show" side to be the thin piece.

In general practice up to three stock thicknesses may be welded without difficulty, but upon reaching four thicknesses 25 to 50 percent more power may be required. More than this are seldom required and should be avoided.

Weldability of Metals

The fundamental theory or law of resistance welding is:

$$H = I^2RTK$$

in which H is the heat generated,
I is the electric current in amperes,
R is the resistance in ohms,
T is the time current flows
K is a variable factor representing heat loss by radiation and conduction.

While this formula applies to all parts of the secondary or welding circuit of the welding machine, we need be concerned only with that part of the circuit constituting the work itself. Of the four factors, I and T are readily controllable on the machine; R and K are functions of the material being welded. Table II shows the comparative values of electrical resistance* (Col. A) representing R in the formula and thermal conductivity representing K. For practical purposes, the factor K may be neglected.

The weldability of various metals may be roughly determined from Column A of the table, although this is not necessarily an absolute guide. Other factors such as alloying elements, impurities, grain structures, surface conditions, etc., greatly affect welding results.

Since most welding is performed on clean mild steel, SAE 1010 or equivalent, welding of other metals is compared to it. Therefore, Column C indicates the relative weldability of some of the more commonly used metals as compared with steel. This weldability is expressed in current requirements, but it doesn't tell the full story. One of the most important factors is the plastic range of the metal, or the temperature range over which a weld may be made. Steel has the widest range of any of the common metals, about 1400 to 2200 deg F. Over this range, the metal is more or less plastic and pliable. Aluminum, like most non-ferrous metals, has a very short plastic range, about 100 deg F at most. More elaborate equipment and controls are thus required.

Surface condition of the stock also greatly affects its weldability. Steel scale, for example, is highly variable, and in some instances its electrical resistance may be so high as to make it virtually a non-conductor. At best, electrode maintenance will be high, appearance will be poor and weld quality variable. If scaly stock must be welded, it should first be pickled.

Zinc coated stock is readily welded, but the zinc coating in contact with the electrodes is generally partially destroyed or damaged due to the vaporizing of the zinc. Electrolytic zinc coated steel is better than hot dipped, due to the more uniform coating. Tin plate and terne plate are also readily welded. Other coatings, such as Parkerizing, Bonderizing or Sheradizing may be practically unweldable due to the scale which constitutes them.

The effects of alloying elements in steel are so varied as to almost defy tabulation. For example, carbon over about 0.3 percent does not affect weldability, but the grain struc-

*Column A is expressed in conductivity, which is the reciprocal of resistance. Steel, whose conductivity is 1/10 that of copper, has ten times the resistance.

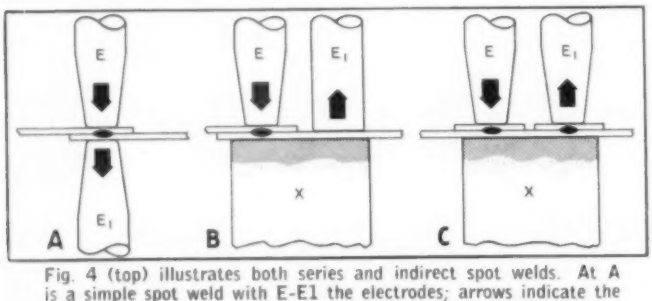


Fig. 4 (top) illustrates both series and indirect spot welds. At A is a simple spot weld with E-E1 the electrodes; arrows indicate the path of the current. Shown at B is an indirect weld, and at C a typical series weld.

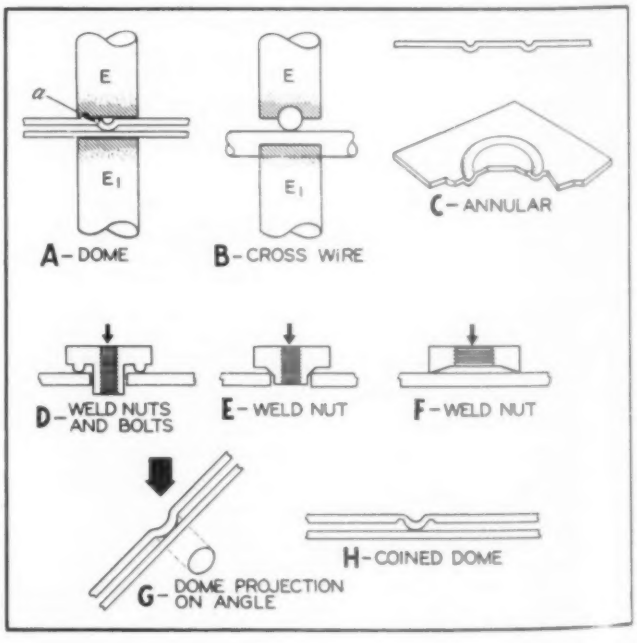


Fig. 5 (right). Among the types of projection welds, design at A illustrates one of the most common. If the pieces are of unequal thickness, the projection should be in the thicker place unless it is two or more times as thick, in which case it should be located in the thinner place. Care must be used to prevent excessive reduction in effective stock thickness along the line a, which is often the case in improperly formed projections. A cross-wire weld, such as used in refrigerator racks, is shown at B. The annular weld, used in welding the shell to the base in metal radio tubes, is illustrated in C. At D, E and F are three types of weld nuts and bolts. Type D may have an annular projection, or several projections consisting of up to six or more individual projections forged in. The form at E must be annular, while F shows a four-sided nut with the corners pressed down. In all these cases the parts should be designed so that tension is in the direction of the arrows. Diagram G shows the shape of projection recommended when the weld is made on an inclined or curved surface. The coined projection shown at H enables successful projection welds in heavy stampings (3/16 to ½ in. thick). In this type, an annular cavity is provided for the flow of excess metal from the extrusion.

Table II—Comparison of Weldability of Various Metals

	A Electrical Conductivity	B Heat Conductivity	C Weld Ability
C. R. S. (SAE-1010)	10	10	1
Stainless Steel (18-8)	5	5	⅔
Silicon Bronze	10	12	½
Red Brass (80-20)	32	36	1½
Yellow Brass (65-35)	27	31	2
Nickel Silver (30%)	4	6	½
Monel Metal			1
Nickel			1
Aluminum (3-5)	70		3
Copper	100	100	5

The electrical and heat conductivities are expressed in percentages of copper. The weldability is expressed in current requird as compared with cold rolled steel.

ture, consequently the weld strength, is greatly affected. Usually, however, subsequent heat treatment will render the grain structure of the weld similar to the surrounding metal.

In addition, it is nearly impossible to definitely tabulate which dissimilar metals may be welded. While many combinations are possible from a laboratory standpoint, most of these are impractical in production. The weldabilities may be roughly judged by the relative characteristics. For instance, steel and stainless steel are readily welded, while steel or stainless to aluminum is considered impossible.

Projection Welding

A projection weld is essentially a spot weld in which the localization of current is accomplished not by the electrodes, but by projections or extrusions placed in one or both of the parts being welded. Fig. 5 shows a few of the numerous types of projections commonly employed. At A is the simplest, or dome type, and its proportions are given in Table III. Since projections are usually formed in stampings, they can in most cases be made in connection with blanking, forming or trimming operations, and involve no additional cost.

The principal advantage of projection welds are two-fold: electrode wear is considerably reduced, and multiple welds can be made in a single operation. Considering the simple projection, Fig. 4A; as current is applied, its only passage is through the contact of the projection to the other piece, thus bringing about a weld similar to a conventional spot weld. Any number of projection welds may be made at one time, the only limitations being machine and power capacities and space requirements. Projection welds can also be made on curved or angular surfaces as shown in Fig. 5G. The angle should not exceed 45 deg and the projection should be (but not necessarily so) oval as shown.

With the increasing use of multiple transformer welding machines, selection between spot and projection welds must be made with care. In the case of multiple spot welds, each spot must be made with an independent electrode. They must have independent springs, or air or hydraulic guns (see Fig. 7). In the case of hydraulic guns, they may be of the grease equalized type, in which case the cylinders are merely filled with light grease and connected with tubing. If the parts are not too large, and the welds are all in the same plane, or nearly so, a standard press type projection welder with suitable fixture or dies may be the most economic method.

Larger assemblies can best be welded on special multiple transformer machines, with individual hydraulic guns for each electrode. However, even in this type, projections are often better than spots due to the much reduced wear on the electrodes. In large machines with a great number of electrodes, the electrode wear may easily be a costly item.

Table III—Proportions of Projections and Projection Weld

U. S. S. Gauge	Stock Thickness A	Projection Diameter B	Projection Height C	Diam. of Fused Zone	Weld Shear Strength
24	0.025	0.081	0.020	0.140	450
22	0.031	0.094	0.022	0.169	635
18	0.050	0.119	0.028	0.225	1350
16	0.062	0.156	0.035	0.255	1950
14	0.078	0.187	0.041	0.281	2700
13	0.094	0.218	0.048	0.310	3450
12	0.109	0.250	0.054	0.338	4150
11	0.125	0.281	0.060	0.350	4800
10	0.140	0.312	0.066	7/16	6000
9	0.156	0.343	0.072	½	7500
8	0.171	0.375	0.078	9/16	8500
7	0.187	0.406	0.085	9/16	10,000
6	0.203	0.437	0.091	⅝	12,000

This table is based on single projections of the dome type shown in sketch.

Large and complicated assemblies can be economically welded in fixtures or bucks, with each spot weld made by a portable gun and manipulated by hand. In many cases several operators, each with a gun, may work on the same assembly at one time. One obvious advantage of fixtures of this type is the fact that a great number of component parts may be located and clamped in place, thus producing a rigid assembly that is dimensionally accurate.

The welding guns themselves are made as light and maneuverable as the job will permit. The transformer is suspended from an overhead support and connected to the gun by means of heavy cables. The gun may either be air operated or hydraulic from an air hydraulic booster.

Economics of Welding

The cost of spot and projection welding may be broken up into four major items:

1. Capital investment—machine installation
2. Power
3. Tooling and maintenance
4. Labor

Considering each of these individually, the production requirements will usually determine the permissable original investment. Simple and inexpensive equipment may produce satisfactory results, but in order to bring costs down, it may be necessary to resort to more complex automatic equipment.

The power cost is generally negligible provided, of course, that adequate power supply is available. If a special power installation is required, this should be considered as part of the capital investment. Some power rates have connected-load clauses which may greatly affect the power costs. Resistance welders do not generally affect demand or power factor charges due to the short time they are actually on the line.

One of the problems in resistance welding is that of test and inspection. There is no satisfactory method of non-destructive testing of spot and projection welds. An experienced operator or inspector may become quite expert in determining the strength and quality of a weld merely from its appearance. Supplementing this, destructive tests may be made from time to time or on regular schedule. If the assemblies are too complicated or expensive for periodic tests, often it will prove satisfactory to weld coupons of the same stock and test them.

In the latter case, however, care should be exercised to obtain exactly the same condition on the test piece as on the actual product. Since the welding current is affected by the mass of magnetic material in or near the throat of the machine, the test piece may be welded under different conditions, producing erratic results.

(To be continued)

Press efficiency increased and production boosted by employing carbide dies

Some Factors in Carbide Die Design

By George Eglinton

LINCOLN PARK INDUSTRIES, INC.

AMONG USERS OF tungsten carbide dies for blanking and piercing, there appear to be four specific reasons which have prompted their purchase of these dies. Most frequently mentioned, but often not necessarily of greatest importance, is a lower overall die cost. If one or more presses are running continuously on one job requiring several identical dies to maintain production, a lower die cost will result from the use of carbide and it will be soon apparent that this is so. The arithmetic involved is very simple. A carbide die, with a first cost of perhaps three to five times that of the same die made of steel, but with a total production of 20 times as many punchings, is obviously going to lower die cost by 75 percent. However, the second reason, which is higher efficiency of the press or, stated another way—better press utilization—is a greater money maker than lower die cost. We have had a number of examples of this in the punching of high silicon laminations where good press efficiency with steel dies is 50 percent. By this we mean that 100 percent efficiency represents the strokes per minute of press multiplied by the number of minutes in a working day. On this work, where two or three hours is a good run for a steel die, we are able to increase the efficiency of the press from 50 percent to 75 percent or 80 percent by using carbide dies; with a consequent improvement in production of 50 percent to 60 percent.

The third reason for tungsten carbide die preference is the higher quality and uniformity of the product of the die—the stamping itself. Since it is good practice to run a carbide die a specific number of strokes for a given material and then to remove it from the press for sharpening before objectionable burrs develop, it is obvious that the quality of the punching itself will be improved. We know of one carbide die user who is benefiting from reasons one and two but who is gaining an even higher benefit from this quality standpoint. With steel dies six presses were required in constant operation to manufacture the laminations for the electric starters and generators which he makes. The higher efficiency of carbide dies is permitting him to operate this job with three presses, but an even greater benefit is that

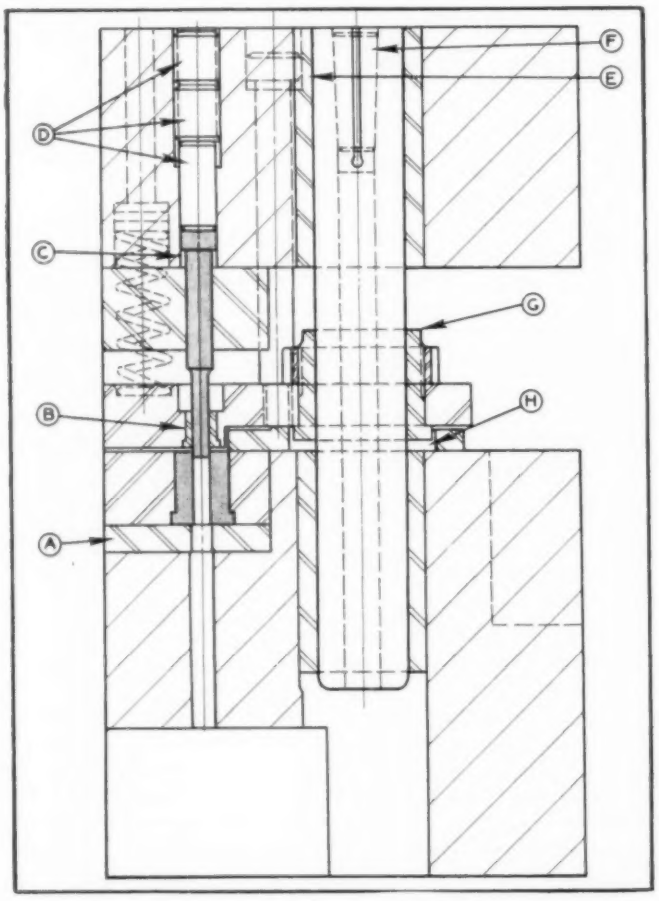


Fig. 1 illustrates a spring stripper of preferred design, closely fitted to all perforators for firm guidance. The hardened backing plate is shown at A; B illustrates the close fit between guide bushing and perforator. A bushing under the head of the perforator, shown at C, permits length adjustment. The lock screws and backing plug at D allow removal of the perforator without dissembling the die. Removal and replacement of the guide pin is permitted by the hardened, ground and lapped bushing shown at E; while the expansion plug at F holds the pin in place. G illustrates the stripper bushing closely fitted to the guide pin, and H marks the reservoir for the pin lubricant.

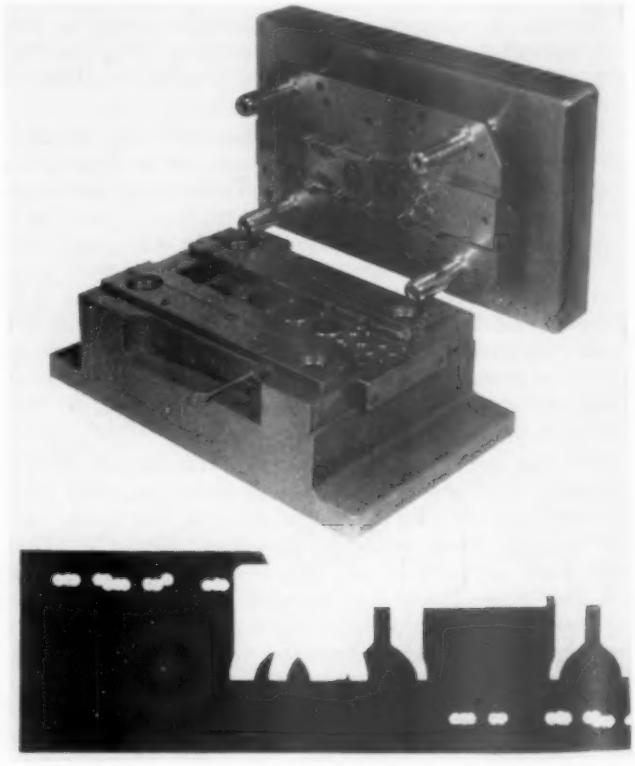


Fig. 2 (top) presents in photographic form a view of the stripper installed in the die.

Fig. 3 (above) shows the scrap strip resulting from failure of the feeders. Nibbling of the stock occurred, but there was no damage to either the die or perforators.

the higher quality of the stamping he produces has enabled him to remove about 10 percent of the laminations previously assembled into his stack without impairing the electrical efficiency of the unit.

Fourth among carbide die advantages is a reduction in maintenance cost. This probably does not constitute a reason in itself since it is related closely to press efficiency but a good example is at hand and should be cited. We know of a user of steel dies whose requirements are 30,000 punchings a day of high silicon lamination. This particular user admitted that he did not use good steel dies but he was proud of the low price at which he was able to buy dies in quantity for this job. Now 30,000 stampings a day should not require the purchase of dies in quantity; in fact, one good steel die probably would have produced his requirements with time to spare each day. However, a press and press operator were devoted fulltime to the manufacture of this small number of stampings. Maintenance cost of the job involved practically the fulltime utilization of a die maintenance man. They seldom were able to get more than an hour's run from the steel die without pulling the die for sharpening or other repair. The installation of a well-designed and well-built carbide die on this job is delivering 75,000 to 80,000 stampings a day, has freed the press for other work, and in addition, has eliminated the fulltime activity of a die maintenance man. Steel dies for this job were purchased in lots of six at a price of $900 each, whereas one carbide die was purchased for $4200 and will outwear at least twenty steel dies of the type previously used.

Design Features in Die Construction

The widest area of disagreement that we have encountered in carbide die design focuses about strippers. Many users are accustomed to the use of spring strippers and will use no other type, and a great many other users just as steadfastly refuse to consider a spring stripper. We can say that there is a preference for the spring stripper of the design shown in Figs. 1 and 2. This type of stripper is closely fitted to all small perforators in the die and is fitted to the guide pins as well. The guide pins are mounted in the top shoe and provide firm positioning for the stripper. Since the movement of the stripper on the pins is only the thickness of the stock plus the amount that the perforator enters the die, it is obvious that the perforator is supported at all times. We have observed this type of job in operation where the feed rolls quit working, with the result that stock was merely inching through the die and the perforator was nibbling half cuts. This continued for several minutes at a time until the operator located the trouble, but no damage resulted to either the perforator or the die. A photograph of this scrap strip is shown in Fig. 3. It is doubtful that any other construction would have survived this operation without damage. Another advantage of this type of stripper is that the surface of the die is exposed in operation and the operator can see whether the die is pulling slugs or if the die is not operating for any reason.

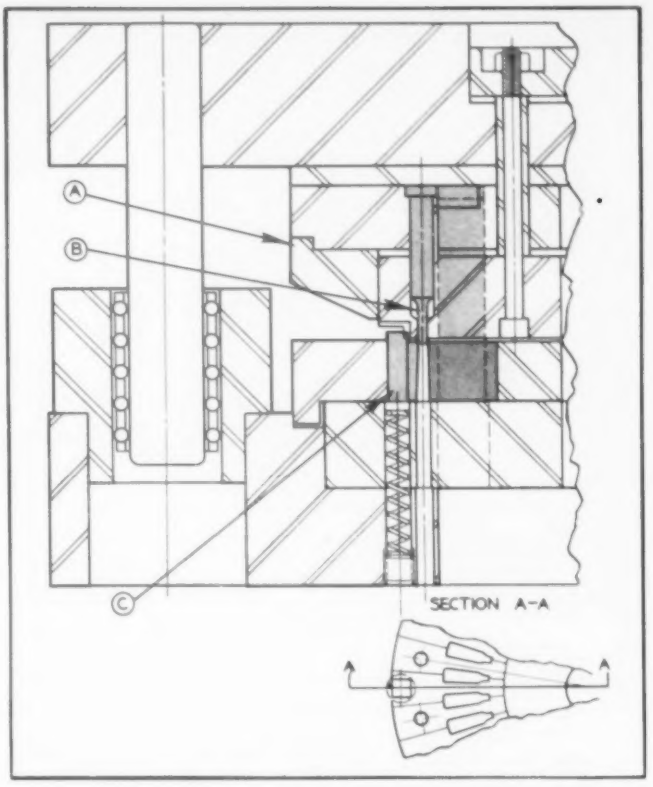


Fig. 5. Shown here is a sketch of the design illustrated in Fig. 4 Bull ring is shown closely fitted to knockout in A. This in turn supports the perforators. Arrow at B shows perforator guided by knockout. At C is shown the spring pin resting blank. Section A-A illustrates a portion of the bottom die, and shows the square knockout pin incorporated on the rim of the die.

Satisfactory operation of carbide dies is being obtained by the use of the conventional box type stripper fixed to the surface of the die. This type of construction has the advantage of being considerably cheaper to manufacture than the spring stripper mentioned above. It is proving satisfactory where the die makes only blanks and does no perforating, and many dies of this type are performing with reasonable satisfaction even where small perforating is done. The perforators with this construction are not supported throughout the stroke of the press and some wear is introduced, since the perforator must engage and disengage the pilot bushing.

Another type of die, of which many have been built in

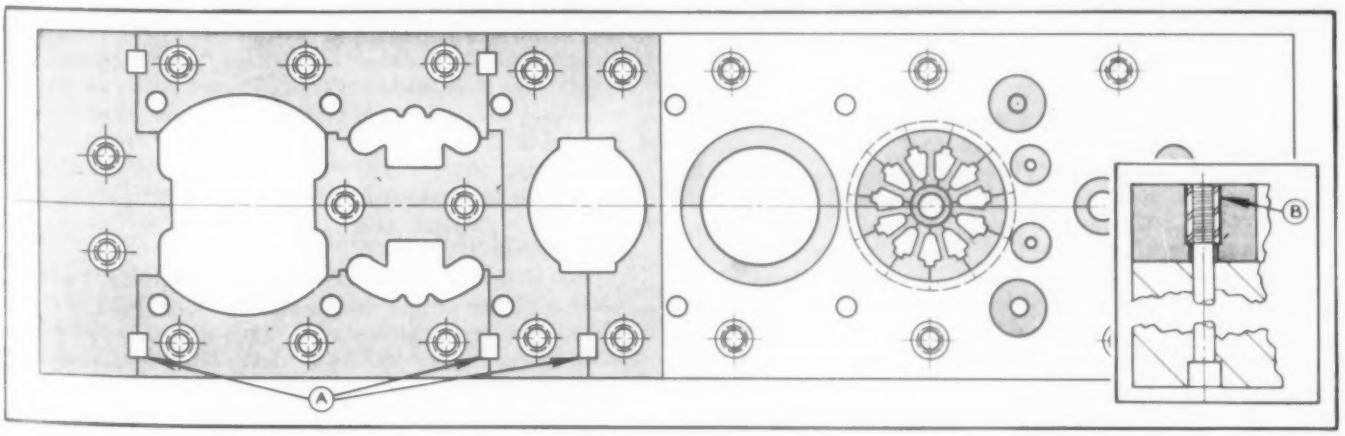


Fig. 6. A successful method of sectioning carbide dies is shown here, particularly with regard to the use of locking pins or keys, as shown at A, to establish position of die sections and to prevent spreading of sections from slub pressure. Inset B illustrates the Invar bushing brazed in place and tapped to receive screw. Hardened steel locating plate is used on the right portion of the die.

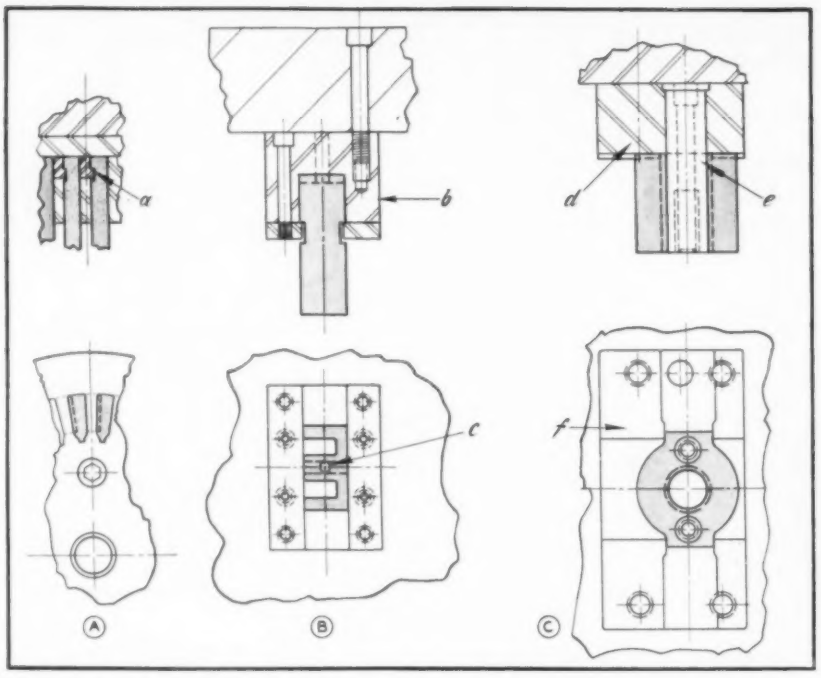


Fig. 7 illustrates a number of methods of holding punches. Referring to diagram A, the arrow at a points outs the lifter keys, which are fitted to keyways in the side of the punches. This construction permits removal of one punch without dissembly of the entire unit. At A, arrow at b at top shows hardened tool steel punch holder. Round dowel, fitted to keyway in punch to prevent endwise movement, is shown at c. Diagram C illustrates hardened tool steel punch holder at d; hardened pin closely fitted to punch holder and carbide punch, at e. At bottom, f points out the nest ground into punch holder to locate punch.

Fig. 8. Good casing of carbide die sections in a circular ring is illustrated in this die photograph. Similar construction is shown in Fig. 10.

carbide, is for one-at-a-time piercing of motor laminations (both rotors and stators) in an inclined press in which a cookie or doughnut is fed into the die off the bottom of a stack by a mechanical feeder and is ejected at the top of the stroke by a knock-out in the press ram. The blank is discharged by gravity (sometimes assisted by air, or a mechanical take out device) through the back of the press while another is being fed into the top of the die. Conventional practice in many plants on this type of job is to build a stiffening ring and knock-out close to the end of the punches while the punches themselves are projecting a couple of inches from their holder. The nest on the bottom of the die which positions the blank is usually fixed to the die and varies from ¼ in. to ½ in. in height. In addition, there is the danger of miscuts and damage to the die when a misfeed occurs.

Improved Stripper Design

The die room superintendent of one of the country's largest producers of fractional hp motors came up with an answer to this one which makes these dies fool-proof in operation. The die is pictured in Fig. 4 and a line drawing of the design is presented in Fig. 5. The idea is simply to use a spring pin nest on the bottom of the die and to encase the entire punch assembly and knock-out in a heavy bull ring. When misfeeds are encountered with this type of operation the upper assembly merely pushes the blank against the top face of the die and maintains a plane surface by depressing the spring pins. No side thrust is encountered except that caused by miscutting the blank, and this in turn is adequately supported by the bull ring. The first such dies which we built have been in operation for more than a year and a more than average number of miscuts have occurred with no damage to the die from this cause.

Generally, miscuts result from neglecting the press and feeding mechanism, which in turn results from the longer runs the carbide dies deliver. When using steel dies on this job dullness of the die was practically always the reason for stopping a run. Conventional practice was to operate the die until the burr height was too great, then to remove the die and install another in its place. At this time the setup man would check the feeding mechanism and the press was maintained in good condition. Since this occurred on an average of once a day, the feeding mechanism and press were maintained in good condition. However, carbide dies on this same job stay in the press for upwards of two weeks and since the die runs satisfactorily all of this time and is delivering practically burr-free blanks, no one thinks to give attention to the press or feeders. The result is that after this excessive length of time, serious malfunctions of the feeding mechanism and press are encountered.

The question which occurs next often regarding carbide dies is in the selection of guide pins. We favor the use of the ball bearing anti-friction pin and bushing on straight-away blanking or on individually fed blanks for repunching. We would favor their use on all dies except that we cannot mount the guiding stripper on this type of pin. When using the anti-friction pin, care should be taken to carefully lap the bushing round and straight after it is installed in the shoe. The pin itself should be carefully fitted in order to establish a definite and uniform pre-load throughout its length. We have encountered no pin trouble in several dies where we were able to use the anti-friction pin and we are hopeful that a way will be found to enable us to incorporate the guiding stripper with this pin. Where the anti-friction pin cannot be used, we favor the expansion type pin.

Sectioning of the Carbide

The sectioning of the carbide in the die itself and the holding of the carbide punches present problems which require considerable study, and here an experienced carbide worker comes into his own. Since the carbide must be ground all over it must be sectioned in such a way that it is readily accessible for grinding. Frequently the conventional method of grinding steel sections cannot be used in grinding the carbide, which means that sectioning and holding of the carbide must be planned to fit the fabricating means avail-

able. For example, where common practice on a steel die section would be to form a grinding wheel to grind a rather wide surface on either the punch or die section, this may not be the practical way to grind the same piece in carbide. One of the most common errors made in the manufacture of carbide dies is to follow conventional steel practice in sectioning. Another reason for study in the sectioning of carbide is to oppose the spread forces of the blank or slug within the die. This frequently necessitates provision for locking keys or projecting lugs on one section to prevent the spread of other, as shown in Fig. 6. It is also desirable to section in such a way as to avoid more than one perforating hole in one section. Holding center distances between two or more holes in one piece of carbide is difficult, especially if the holes are small or near the edges of the piece or if there is considerable distance between the holes. This problem is simplified somewhat if the location of the holes is such that bushings can be put in the carbide section. The use of bushings enables larger holes to be preformed into the rough blank and it becomes a relatively simple operation to accurately position them by grinding. We consider it to be good practice to use a carbide bushing in the die for perforating small holes everywhere that the shape of the blank or the section permits it. Replacement of the bushing is a simple matter in the event that it becomes chipped on its cutting edge, or if excessive wear occurs in the hole itself. It might be well to state at this point that it is sometimes necessary to provide less break clearance on small perforations in order to prevent pulling slugs and this, of course, produces more rapid wear at these points of the die than occurs at the main blanking stations.

It is difficult to establish a formula by which to be guided in determining when a punch or perforator should be guided into the die and when it can be left to operate freely. The type of press in which the job is being used and the material being punched must both be considered. Common sense can be applied here and if mechanical judgment tells us that the proportions of the punch are strong, clearance can be provided around the stripper. If mechanical sense tells us that the punch is fragile and vulnerable to breakage from side pressure, then it should be guided. One job done without guiding is the perforation of moving picture film which is an easy-to-cut plastic, 0.006 in. thick, with perforators measuring only 1/16 in. wide by 3/32 in. long. These operate in a precisely built press under ideal operating conditions. On the other hand, if we were punching ⅛ in. thick material with difficult punching qualities, even though the punch were ½ in. in diameter, we would recommend that it be guided in the stripper. No hard and fast rule has yet emerged to guide us on this question.

The mounting of punches is usually accomplished by making a two piece holder, nesting around the punch, with a key to lift the punch which is inserted into a ground groove in the punch. This frequently calls for some careful engineering, especially if two or more punches are closely adjacent to each other. Examples of this are shown in Fig. 7. Round hole perforators can usually be employed.

Mounting and Casing Carbide Sections

In addition to sectioning, the use of carbide necessitates a radically different approach to the problem of mounting the carbide to the die shoe and casing the carbide sections. There are wide differences of opinion as to how this should be done, but here too, experience is pointing to an efficient method. Carbide dies have been built according to varying designs, from screwing and doweling the sections unsupported on the top of the die, to rigidly casing them in a shrink ring and nesting them inside the die shoe. From our experience we recommend that wherever possible the die be cased in a circular ring which is approximately the same height as the carbide section. This type of mounting becomes fairly simple when only two or three sections are to be mounted but obviously cannot be used due to space limitations if the die area is great or if a great many sections are to be cased. Lacking the room for a circular ring or in the event of design complications, a rectangular ring ground on the inside to closely fit the overall dimensions of the assembled die sections is next best. Casing the sections in this fashion effectively opposes the spreading forces of the slug within the die and permits us to use less back taper with longer maintenance of important blank dimensions.

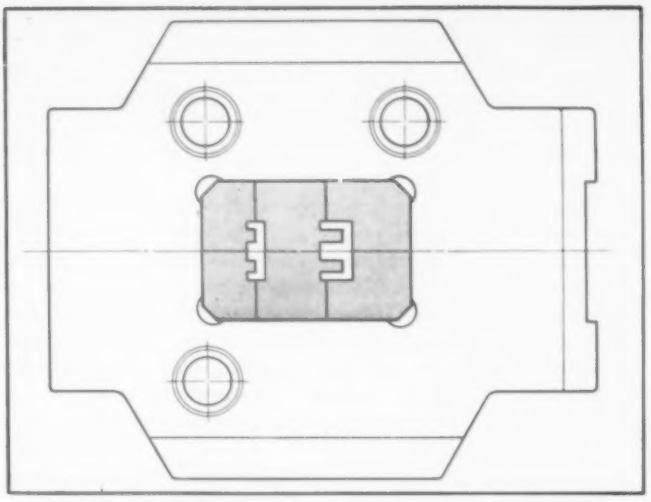


Fig. 9. Where design becomes complicated or where circular sectioning is not feasible, casing in rectangular ring as shown above is successful. Here three carbide sections are cased in a rectangular ring, which is same height as carbide sections. Note that sections are not parted at corner intersections. This design permits grinding a small radius in each corner of die opening.

Another method in common use is to fit the die sections into a slot, which is machined and ground, in the top of the die shoe. When this construction is used it is advisable to increase the back taper in the die and to enter the punches somewhat deeper than would otherwise be required. Unless this is done, spreading forces can be built up from the slugs which will bend the shoe, increase the break clearance between the punch and die, and cause a prohibitive burr on the punching. Dies built in this fashion deliver good performance but not as good as where the casing methods mentioned above can be employed. Specifically where we case the die a satisfactory back taper has been found to be 0.0015 in. per side per inch of length. By contrast, dies supported only by the shoes have required 0.0025 in. to 0.0035 in. back taper per inch of length.

A dangerous practice in mounting die sections is to fit them in a counterbore or to hold them by means of taper wedges. Attempting to mount two or more sections into a counterbore poses a problem in fitting that is difficult to live with. Assuming that we are able to get a straight wall in the side of the counterbore, a perfect fit of the carbide to the counterbore, and an absolutely flat bottom in the counterbore upon which the carbide is to rest, we are still in trouble due to the greater shrinking pressure at the bottom of the counterbore than that at the top. Sections fitted in this fashion will generally spread at the top more than they do at the bottom, which of course, increases the break clearance and burr height on the top of the slug.

Generally speaking, satisfactory punchings result from break clearances substantially greater with carbide than is customary with steel dies. It is difficult to state why this should be so unless the mere fact that a sharp cutting edge maintained for a greatly longer period produces this result. We have had several instances in which the customary break clearance for a steel die had been installed on carbide dies and, of course, we produced a satisfactory blank. Upon making an identical die with even 50 percent greater clear-

ance on the carbide die, we find no noticeable difference in the quality of the blank but we produce a looser slug in the die and increase the length of each run substantially. We would recommend on average pierce and blanking jobs, such as silicon sheet, mild steel or even high carbon steel such as razor blades, that a full 5 or 7 percent of the metal thickness per side be specified.

Frequently the use of tapered wedges is resorted to both for locating carbide sections in a die and for holding the sections down in a die. In either case the pressure exerted by the wedges tends to stress both the carbide itself and the die shoe. All of us are familiar with the tremendous force exerted by pulling a slightly tapered wedge into an opening by means of a screw. Carbide stressed by the forces thus exerted is more vulnerable to breakage than if it is nicely fitted to a casing ring. At first glance both the counterbore and the wedge appear to be a practical out from both a design and manufacturing standpoint and undoubtedly they are simpler to produce. The results, however, as indicated by performance of dies built in this fashion do not justify their use.

Material Selection

We are frequently asked what grade of carbide to use in a die. Left to our own we have, with few exceptions, specified the so-called 20 percent cobalt grades, as identified by the Carboloy Company as Grade 55B, by Allegheny Ludlum as Grade CA-11 and by Firth-Sterling as Diecarb 3. These are one of the softer and stronger grades of cemented carbide; however, several users have specified harder grades and are getting satisfactory performance. Generally speaking, it appears that those shops which are using a great many carbide dies and have better than average maintenance facilities, can successfully use the 13 percent cobalt grades which are one step harder in the carbide hardness range. It is a little premature to state this arbitrarily, since one of the country's largest users of carbide dies, who has several identical dies on one job and has tried both grades of carbide, is coming to the conclusion that the softer grade produces better results. The softer grade of carbide on this particular job delivers run after run of uniform length and quality, and while the harder grade delivers some runs even longer than the soft grade, there are a number of short runs due to chipping on the edge of the die.

What material to put in the die set itself—the upper and lower shoe—is frequently questioned. Our practice is to use the material that our customer prefers whether it be ordinary grey iron or hardened tool steel. From an all-around good performance standpoint, both from stability and ease of manufacture, compressive strength and resistance to stretching from repeated impact, it appears that Meehanite of the GA type ranks high. This material is readily available in the form of good castings and presents no difficult machining problems. It is, of course, good practice to normalize these castings after rough machining or in the case of very simple shoes where no great amount of machining is to be done, they can safely be normalized before machining.

Adding a few "don'ts", we would advise against the use of brazing in connection with attaching the carbide to its holder or to a punch. We have occasionally seen good performance from brazed pieces of carbide, but as a rule the braze itself will fatigue from the repeated impact of the press and failure will occur at the braze. It is also wise to avoid clamping the stem on the upper shoe into the bore in the type of press ram found on the C frame press. If it is necessary to operate in this type of press, arrange to bolt the die flat to the ram surface. Very few presses, especially after they have been in use for some time, maintain the alignment necessary in the bore to avoid stressing the die and twisting the top shoe out of the parallel with the lower shoe. Don't neglect the press and feeding mechanism and the press surroundings simply because the die is delivering long performance. Don't run the die until the burr height is objectionable or reaches its maximum limit. A great many more stampings per dollar of die cost will be produced if the length of run is established on the basis of removing not more than 0.005 in. from the surface of the die during sharpening. Unfortunately this cannot be expressed in terms of the number of strokes the die should be permitted to make since it must be determined on each particular job and on each particular type of material being punched. The length of runs may vary from 250,000 strokes on material with extremely difficult punching qualities to upwards of 5,000,000 strokes on materials with good punching qualities.

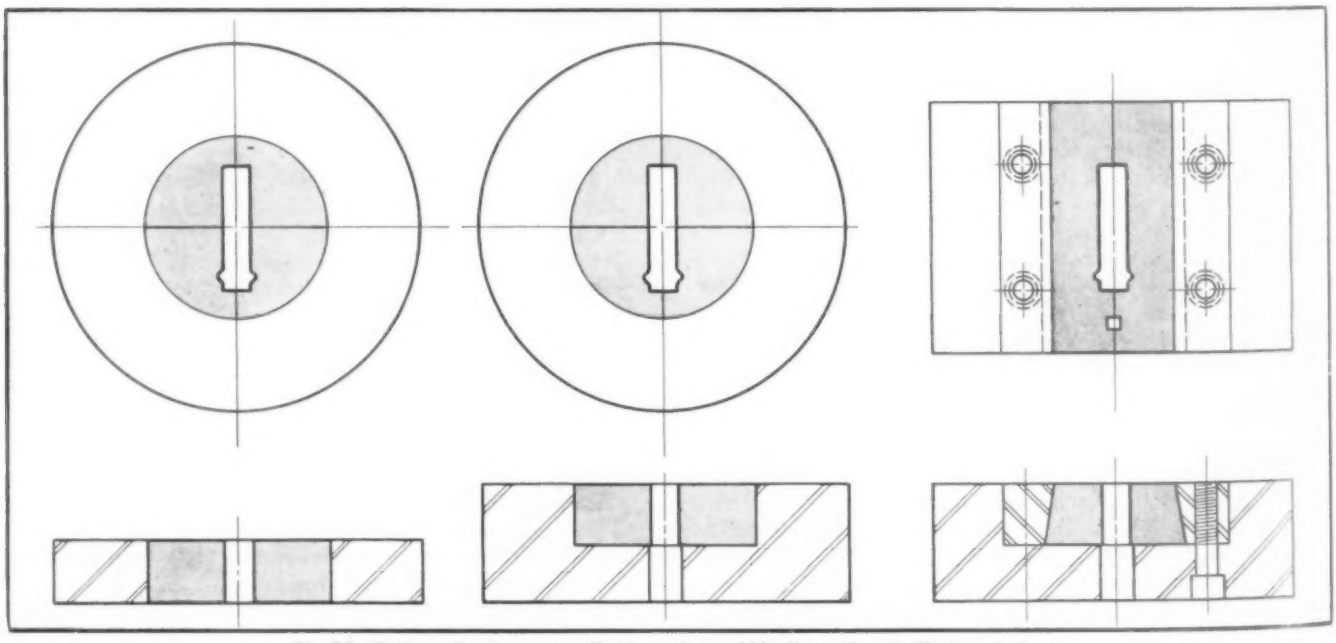


Fig. 10. Both good and poor practice in casing carbide die sections is illustrated above.

Good Practice
Die sections are cased under uniform pressure from top to bottom. Straight-through fit is easier to establish than in counterbore design.

Poor Practice
Difficult to establish uniform holding pressure in counterbore.

Poor Practice
Forces exerted by wedges and by slug pressure will bend the holder and open die at top.

An Outline of Dielectric Heating

By Frank W. Curtis

HIGH FREQUENCY HEATING, often referred to as electronic heat, has two distinct fields: induction heating for metallic materials, and dielectric heating for non-metallic materials. Dielectric heating, while newer and less known by the engineer, will in time be as adaptable for the heating of non-metallics as induction has been in the metal-working field for such operations as hardening, soldering, brazing and forging.

Basically, dielectric heating is applied to materials that are poor electrical and thermal conductors, such as wood, plastics, rubber, paper, ceramics and chemicals. The materials are placed in a high-frequency field, usually between or adjacent to electrodes. This field passes through the work and causes a molecular action to take place throughout its entire cross section, with the result that the temperature rise is uniform, regardless of the thermal conductivity, provided the mass has equal density and moisture content.

Non-metallic materials usually are poor conductors of heat and when placed into a conventional oven, or heating chamber, they have a tendency to heat on the outside first, with little temperature change in the center at the beginning of the cycle. Finally, the center begins to heat but by this time the outside may have become overheated, or even burned.

With dielectric heating, however, the mass heats uniformly, because each molecule of the material is aligned to the rapidly alternating reversals of the field, a motion that results in friction, causing the mass to absorb an equal amount of energy. A dielectrically-heated material, due to heat radiation from the surface has a tendency to have a slightly higher temperature at the center than on the outside. This temperature differential is very small, but is probably the reason why dielectric heating is sometimes referred to as the process that "heats from the inside out."

Principles Involved

From the tool engineer's point of view, the mechanics of dielectric heating, namely the design of the electrodes, and the means by which the work is to be loaded, are the most important considerations. Also essential are an overall analysis of the heating problem, an estimate of power required and heating time in order to obtain a production rate. To this may be added the possible modification in design to make dielectric heating more practical, as well as substitutions of materials such as adhesives and binders, which react better to electronic power.

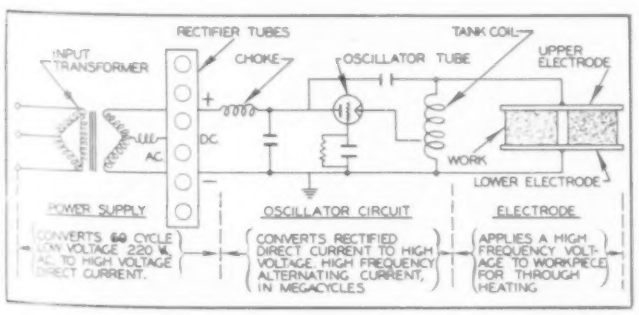


Fig. 1. Typical circuit diagram of a vacuum-tube generator for a dielectric heating installation. Such generators provide power outputs of from 1 to 50 kw, at frequencies of from 2 to 50 megacycles. Voltages range from 4,000 to 12,000 volts.

Dielectric heating is carried out by vacuum-tube generators, or oscillators, which transform electrical energy to a high-frequency field. A typical circuit diagram is shown in Fig. 1. Usually, 220v ac is stepped up to a high voltage and rectified to dc, providing the power supply portion of the circuit. This current is then converted to a high frequency alternating current, which in turn is applied to the electrodes and into the work. The most popular generators in use provide output power of from 1 to 50 kw.

Dielectric generators operate usually at frequencies of 2 to 50 megacycles (million cycles per sec.), and at voltages of from 4,000 to 12,000 volts. The frequency should be such that it offers the greatest loss factor, to utilize the maximum capacity of the generator. The voltage should be as high as possible, but slightly below the point where flashover occurs. The usual practice is to raise the voltage to a flash-over point, then reduce it to a safe operating value.

Power Calculations

The voltage through a non-metallic piece to be heated should be uniform. At high frequencies, however, a wave length is created, so that a limit in the length of the electrode must be considered. Usually, the length of electrode is from 1/10 to 1/20 of the wave length. At 15 megacycles the wave length is 20 meters, and at 20 it is 15 meters. As a rule, electrodes of 2 to 3 ft in length, used at a frequency of 15 megacycles can be used with little variation in voltage. For work that requires longer electrodes, 6 or 8 ft for example, tuning stubs should be provided to the electrodes, or the electrical circuit connected so that a uniform voltage will be distributed over the entire length of the electrode.

The most common form of electrode is flat, as shown in the diagram, Fig. 1, although many other forms and shapes can be used. One electrode is grounded and the other is the high-voltage potential. Between these electrodes are many lines of electrostatic force. Material placed between these plates, which are usually made of brass or aluminum, becomes the dielectric to complete the circuit, and the rate of heating is influenced by the voltage and frequency of the field, and the

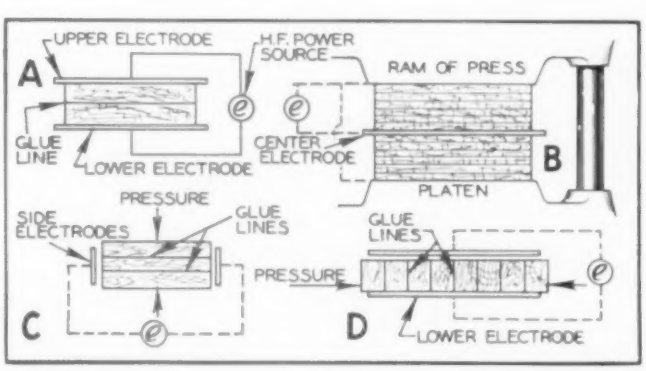


Fig. 2. A number of methods of gluing are shown in the sketch above. The form at A incorporates parallel electrodes, between which the assembly is placed. At B, by using a grounded press several assemblies are glued simultaneously. Glue-line heating, where the energy is limited largely to the area around the glue, is shown at C. Another form of glue-line heating is seen at D, where the electrodes are in a horizontal position.

loss factor of the work (power factor X dielectric constant), expressed:

$$1.41\ efE^2 = W$$

where:

1.41 = Constant that takes care of power loss in circuit
e = Loss factor of material
f = Frequency in megacycles
E^2 = Voltage impressed into material
W = Heat in watts per cubic inch

This formula is used to calculate the power needed to heat a given material, and to determine the size of generator required to perform a specific job. The most common formula, usually considered by the user of a dielectric heating unit, is to work from a given available output power rating, and then calculate how much material can be handled from that source.

To determine the Btu's required to heat a non-metallic mass, the formula is:

$$Btu = SW\triangle T$$

where:

S = Specific heat of material
W = Weight of material to be heated in lb
$\triangle T$ = Temperature rise in deg F

This calculation determines the power required independently of time. For example, to heat 4 lb of a material with a specific heat of 0.45 to 150 deg F, then:

$$4 \times 150 \times 0.45 = 270\ Btu$$

Since there are 56.7 Btu kw, then with a 10 kw output generator, or about 560 Btu min, the heating time would be 270/560, or a ½ min.

In Table I a list of many common materials heated by high-frequency power, listing the physical constants necessary for calculations, is given. With some materials, the loss factor changes as heating takes place, usually increasing at the start of the cycle as the load warms up, which results in quicker heating. As the material dries out the loss factor decreases and the rate of power absorption falls off. In drying, for example, load characteristics may be maximum at the start of the cycle then fall off proportionally as moisture is evaporated, indicating that the drying operation has been completed. These readings are indicated by meters recording plate dissipation.

Wood Assemblies

In the gluing of wood by dielectric heat, it is sometimes advisable to substitute the glue used in order to obtain best results. For example, animal-type glues are replaced by urea and phenolic base glues because of their superior setting qualities when subjected to dielectric heat. They have excellent water and moisture resistance, and can be set up in a matter of seconds at from 200 to 250 deg F, the urea setting at the lower temperature range. While these glues set at room temperature in 4 to 8 hr, the advantage of dielectric heat is the elimination of storage space, and extra handling, because a dielectrically glued assembly can proceed immediately to the next operation, thus permitting a continuous flow of production.

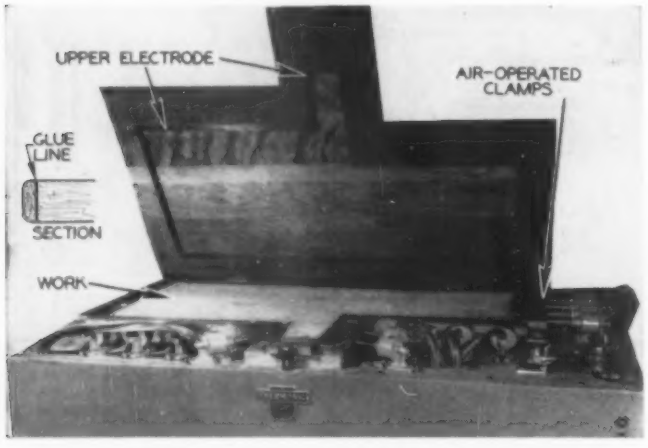


Fig. 3. As shown above, electrodes for dielectric heating can be shaped to conform to the outline of the work being processed.

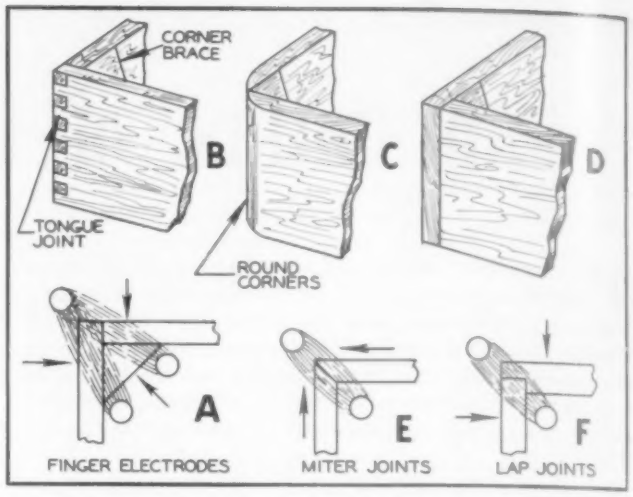


Fig. 4 illustrates the use of the finger electrode in dielectric heating. At A, E and F are shown various joints possible with this electrode, while at B, C and D are seen steps in the evolution of an economical joint through the elimination of the miter formerly used, then redesign of the rounded corners into the efficient form shown at D.

Wood gluing differs somewhat from other dielectric heating operations. Because of the difference in loss factors between relatively dry wood and moist glue, it is possible to direct most of the enegry to the glue line, without developing too much heat in the wood. This variation will depend on the relation of the electrodes to the glue line, and the type of assembly being handled.

A common form of electronic gluing is shown at *A* in Fig. 2, using parallel electrodes, between which the assembly is placed. Another similar form is shown at *B*, in which several assemblies are glued simultaneously in a press, the frame of which is grounded, and for which set-up a flat plate electrode is placed between the assemblies to be heated. In both of these examples some energy goes into the wood because the voltage must pass through the entire charge. In the example at *C*, however, typical of glue-line heating, the electrodes are at right angles to the joint, so that the energy is largely limited to the glue. Another form of glue-line heating is shown at *D*, where several sections are joined together. The limitation for glue-line heating is the length of joint in relation to available power, although a joint longer than 12 in. might present problems due to the dissipation of the electrostatic field.

Electrodes can be shaped to conform to the outline of an assembly, as illustrated in Fig. 3, which shows an electrode cabinet used for gluing a hardwood facing around the edge of a plywood panel. The hardwood edge strips are held firmly against the panel by a series of small air-operated clamps. The upper electrode is attached to the hinged cover, which is lowered during the heating cycle, requiring about 2 min.

Another form of electrode for wood gluing is the finger type, shown in Fig. 4, at *A*, arranged with two grounded members on the inside and the high-voltage finger electrode on the outside, so that the field covers the entire joint to be glued. This style of heating has often resulted in manufacturing economics. For example, the box at *B*, formerly made with a tongued joint, and a brace nailed on the inside, required several hours setting time. Finally, the corners were rounded as at *C*, so that tongued joint, which only acted as a means of assembly, was completely sanded away. By the electronic method, the joint is made, as at *D*, using a pressure fixture to hold the sections firmly together for a few

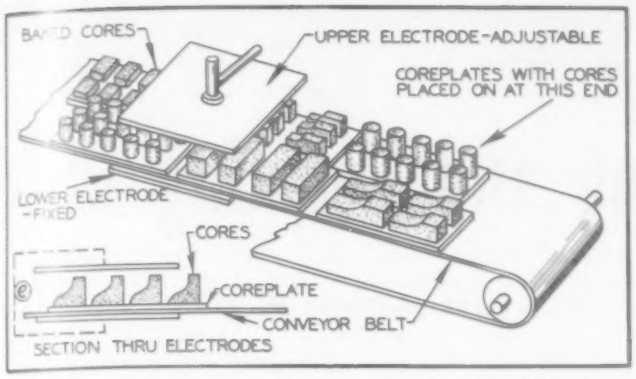


Fig. 5. A dielectric installation using a continuous feed belt is shown above. In this set-up, for the baking of cores, the material passes between two parallel electrodes for baking.

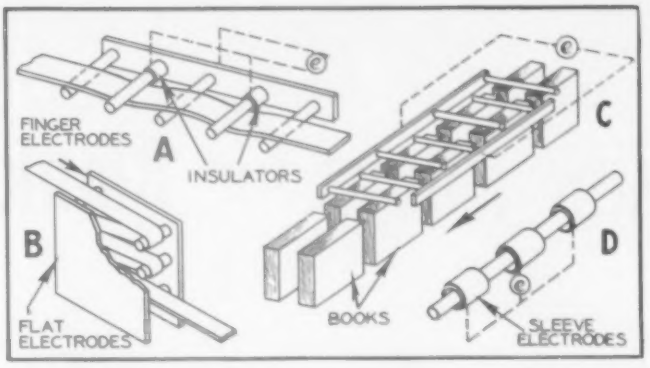


Fig. 6. Four methods for heating or drying thin sections are illustrated here. At A, where the sheets cannot be stacked, finger electrodes are utilized to obtain heating efficiency. Flat electrodes are used at B, where the material is passed between them on rolls so as to gain maximum heating time in the field. Drying of books, as shown at C, is handled easily by staggered electrodes. Sleeve electrodes are employed at D for the drying of cardboard mailing tubes.

seconds during the heating cycle. Other forms of corner joints that can be made this way are shown at *E* and *F*.

Dielectric Core Baking

For electronic core baking, the process of making cores is the same as usual with the exception of the sand mix. Instead of using core oils, such as linseed, a thermosetting binder either of the dry or liquid type is used, because of its superior setting up qualities at lower temperatures of about 240 deg F, as against 450-500 deg F for oil-mixed cores. As a rule, a dielectric core mix is less expensive, with the added advantage of having better collapsibility and shake-out characteristics. The speed of baking, too, is a feature, because the average core, up to 5 or 10 lb, can be baked in two minutes or less, as compared to 2 to 4 hr with an oil core in a conventional oven.

In Fig. 5 is illustrated a typical core-baking set up, using a continuous feed belt, onto which loaded coreplates are placed. The cores pass through parallel electrodes, from where the vapor is blown off and exhausted, as heating takes place. The electrodes and a portion of the belt at each side are completely enclosed in a metal tunnel housing, not shown.

Advantageous features of electronic core baking are the thorough bake obtained, and the elimination of overbaking once the moisture has been evaporated. A sand core, like any organic material, is a poor heat conductor, so that with conventional baking a wide temperature gradient exists.

TABLE OF DIELECTRIC CHARACTERISTICS

Material	Specific Heat Btu/lb/ Deg. F	Dielectric Constant At 1 Meg	Power Factor At 1 Meg.
Asbestos	0.19	5.–9	0.06
Bakelite	0.3–0.4	4.5– 7.5	0.01 –0.03
Casein Plastics	0.6–0.68	6.1– 6.4	0.052
Cellulose Acetate	0.3–0.45	4.5– 7.5	0.03 –0.06
Fibre	----	4.8– 7.0	0.05
Glass, Common	0.19	7.6– 8.0	0.008
Mica	0.20	6.0– 8.0	0.04 –0.07
Paper, Kraft (Dry)	----	2.0– 2.6	0.005
Phenol Resin (Cast)	0.3 –0.4	5.0–11.0	0.01 –0.1
Phenol Formaldehyde	0.38–0.42	4.5– 6.0	0.07 –0.15
Plexiglass	0.35	2.5	0.05
Polystyrene	0.53	2.6	0.003
Porcelain	0.26	6.5– 7.5	0.005–0.015
Rubber, Hard	0.48	2.5– 2.3	0.006–0.02
Urea Formaldehyde	0.4	6.0– 7.5	0.03 –0.04
Birch	----	5.2	0.065
Mahogany	0.45	3.4	0.019
Maple, Hard	0.54	4.4	0.033
Oak	0.57	3.3	0.039
Pine, White	0.42	3.6	0.025

These values are typical and will vary with temperature and frequency changes.

Dielectrically-baked cores, on the other hand, are equally cured throughout their cross-section, which reduces gases resulting from trapped moisture. A 15 kw output generator will bake approximately 700 lb of cores per hour, with a moisture content of 4 percent.

Handling Thin Sections

The heating or drying of thin sections sometimes is limited by electrode spacing and the danger of flash over. Also with some thin work it is difficult to load sufficient energy at a fast enough rate, one such example being the drying of ink on paper. One solution in such cases is to stack several thicknesses and to heat them simultaneously. Where this cannot be done, such as in the case of progressive heating of strip material, it is sometimes possible to use finger electrodes as shown at *A*, in Fig. 6. The fingers are alternately connected to the power source, so that a field is set up between each finger through which the work passes. Another way is to use flat electrodes, as at *B*, and to arrange the feed of the work in such a way that it passes back and forth over non-metallic rolls, and thereby remain in the field long enough to become treated. The drying of glue on books is handled by staggered electrodes, as shown at *C*. Using a urea-type glue, such an operation can be handled in 5 to 10 sec. The same form of electrodes can also be positioned above and below the work, so that the work passes between the fingers, much like the example at *A*. Another style of electrode is the sleeve type illustrated at *D*, such as used for the fabrication of cardboard mailing tubes. A modification of this design is to use a metal mandrel, which is grounded, and to have the cuff or sleeve electrodes connected to the high-voltage lead of the power source.

Because of the high voltage required for high frequency heating it is necessary to provide electrically interlocked shields around the electrodes. These shields also provide a means of reducing radiation to a point where interference to communication systems and other electrical instruments is overcome. Electronic equipment of this kind must operate within an allowable radiation level of 10 microvolts per meter at one mile to conform to the requests of the Federal Communications Commission. Otherwise, the equipment must have a frequency stability enabling operation within required frequency bands of 13, 27 and 40 megacycles.

Dielectric heating offers high efficiency of power or heat conversion to the material to be heated. Usually, there is little loss, if any, because only the material in the field will absorb energy. Contrasted with conventional oven heating, where often only from 10 to 35 percent of the input energy in Btu's is utilized by the load, dielectric heating provides economical heat, and in many cases a lower operating cost.

Temporary dies for sheetmetal working results in marked economies

Zinc Alloys for Blanking and Forming Dies

By Gilbert P. Muir

A WARTIME DEVELOPMENT that has gained increasing usage since the war is the application of zinc-base alloys for short-run blanking and forming of sheetmetal parts.

Born in the aircraft industry during the early nineteen-forties, because of the need for accurate reproduction of a limited number of parts, these alloys have found their way into a number of industries since, and surveys indicate that a considerable number of other industries can benefit from this economical method of die manufacture.

One of the most popular of the zinc-base alloys is Kirksite "A", produced by the National Lead Company. With a composition of 3.5-5% aluminum, 4% copper, about 1% max of magnesium and the balance zinc, the alloy has a melting point of 717 deg F. Tensile strength of the material is about 37,800 psi, which compares to a value of from 18,000 to 50,000 psi for gray cast iron.

Chief advantage of the dies is their low cost of manufacture, and the relatively high volume of production on some parts which can be obtained. Since the material can be cast-to-shape from plaster molds with little finishing required, overall cost of the die is small when compared to that of the conventional steel die. At the same time, life of the die varies from a few hundred parts when working with heavy material or complicated designs, to as high as fifteen thousand or more on light materials with simple contours.

Approximately 1200 of these 0.037 in. steel parts were blanked on one rolled Kirksite die and formed on cast Kirksite die and punch.

Making the Pattern

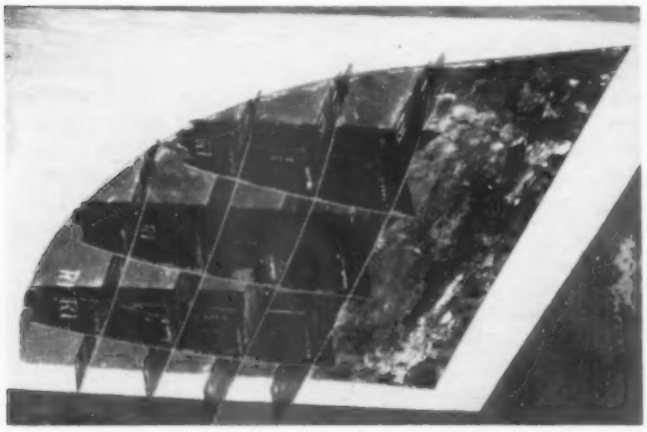
One of the characteristics of Kirksite A is its ability to faithfully reproduce the surface of the mold from which it is cast. Plaster pattern manufacture must, therefore, be undertaken with considerable care.

While either wood or plaster patterns may be used with success, the latter are less expensive, and produce results at least as good as wooden patterns. Many users combine the use of plaster patterns with drawings designed for use with the so-called loft template method of pattern manufacture. Here outlines from the drawings are reproduced on a thin steel sheet, comprising a series of transverse cross-sections equally spaced along the center line of the die. In reproducing these outlines on the steel sheet, the patternmaker uses a pantagraph or photographic methods to provide for shrinkage. When the templates are sawed out and set up, $\frac{3}{4}$ in. sections of paraffine-dipped plywood are spaced to form a honeycomb, which is then filled with the plaster of paris reinforced with hemp fiber. It is recommended that after drying, the pattern be coated with shellac to avoid absorption of moisture.

Foundry Practice Relatively Simple

Speed and simplicity are among the advantages of Kirksite in die manufacture, and foundry methods are generally without complication if a few precautions are observed.

With the low melting point of Kirksite (717 deg F), the investment in foundry equipment is not excessive, and an ordinary oil- or gas-fired furnace with iron melting pot is suitable. Care must be taken here to insure, however, that the composition of the pot selected is such that the pot is



This three dimensional form is filled with plaster of paris to produce a smooth, accurate pattern.

Good pattern practice is reflected in the view shown above. Careful attention to finish and accuracy produces results in die savings

not attacked by the zinc alloy. National Lead suggests one analysis which has proved satisfactory: C, 3-3.50%; Si, 1-2%; Mn, 0.60-0.75%; Ni, 2-2.50%; Cr, 1.10-1.20%; Mo, 0.40-0.60%. A chemical coating is also available to protect the pot from attack by the alloy.

During melting it is advisable to keep the melt under fairly close temperature control; if the charge is to be held for any length of time, holding the melt at 800 deg F will reduce any attack on the iron pot.

An important advantage of the alloy is the fact that after the die has served its purpose, the metal can be remelted and recast with a recovery of 95 percent or higher. Remelting is facilitated if a little molten alloy is present in the pot to aid in heat transfer to the scrap die. Dirt and oxides are separated by the addition of a few pounds of a 50-50 mixture of salammoniac and zinc chloride. One precaution to be observed here is that extreme care must be exercised to prevent any contamination of the zinc alloy by lead or tin, even in small quantities. Since either lead or tin is detrimental to the aging characteristics of an aluminum-zinc alloy, they must be excluded from the melting pot.

Preparation for Casting

The open-mold method of casting is recommended for Kirksite as the most satisfactory process for obtaining good castings. Briefly, this process involves placing the pattern on a cleated platform which rests on the floor. The platform has the same dimensions as the exterior of the flask that is to be used, and the flask is placed around the platform, with the pattern fitted inside. After dusting the pattern, fine sand is sifted over the surface, then additional sand is shoveled in and tamped down. No vents are necessary except with unusually deep dies. Excess sand is leveled off, and a cover duplicating the platform on which the assembly rests is bolted on top. The entire mold is turned over, the pattern is withdrawn, and any required patching is done on the mold.

Gating is generally done on one end of the mold; some foundries prefer to pour directly into the mold, but this is not recommended.

Design Considerations

As has been mentioned earlier, little if any finishing is required on the dies after casting, and generally the first few stampings are sufficient to further polish the die when the material being stamped is steel. In the case of aluminum, a flexible shaft grinder fitted with a fine abrasive disc will provide a satisfactory polish.

For die repair or resurfacing, Kirksite dies can be "built up" by welding, using either a Kirksite A or straight zinc rod. Successful hard-surfacing of the zinc alloy has been accomplished by electroplating chromium on the wearing surfaces of the die. Since the die material is softer than the material being stamped or formed in many cases, wear occurs at such

A flexible-shaft hand grinder is used to polish the surface of this large cast Kirksite forming die. Note coring to save weight.

Over 400 pieces of this stainless part were produced on Kirksite forming dies with the dies still serviceable. Material was 0.091 in. thick; depth of draw was 2½ in.

stress points as the die corners. To reduce this, steel inserts can be cast in the dies during manufacture.

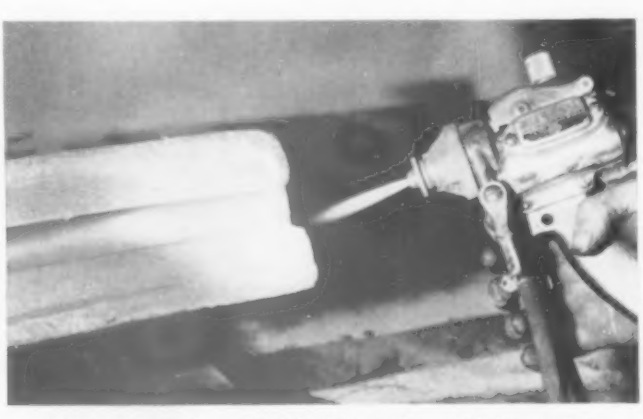
Rolled Kirksite sheets have been used successfully in a number of instances where production requirements have not justified the cost of steel punch and die. Generally a steel punch is employed in conjunction with a Kirksite A die.

When designing blanking Kirksite dies, it must be kept in mind that there should be no clearance between the punch and die. The value of the material in blanking is that it has a tendency to flow toward the punch and thus keep the cutting edge honed, and if clearance is present rapid failure will occur.

Economics of Zinc Alloys

The use of zinc alloy dies has spread from the aircraft industry to many others where production is not high enough to warrant conventional die cost. Automobile manufacturers have discovered the economies available when limited production runs are present. But and commercial truck manufacturers have depended upon the dies for some years.

Thus we have several advantageous cost factors in connection with temporary dies: the complete die can be made from drawing to die, sometimes in as little as one day; labor costs are reduced greatly; the die material is actually a capital investment, since it can be used over and over. The number of parts which can be made from one die varies, naturally with the grade and thickness of material being formed, and the nature of the forming operation. However, in a number of cases it has been found more economical to make up to three sets of zinc alloy dies to produce a part, rather than to invest in one set of ferrous dies to produce the same quantity. Thus temporary dies have a wide application among processors of aluminum, magnesium, steel, Inconel, stainless steel, and materials such as Formica.



Kirksite dies can be successfully built up by metallizing, as shown above. Worn dies can thus be reclaimed at an additional saving

PART TWO

Chemical Surface Treatments for Metals

By A. E. Durkin

GENERAL ELECTRIC CO.

IN TREATING ALUMINUM to obtain maximum corrosion resistance, coatings are produced by (1) electrolytic and (2) chemical means.

The most commonly used electrolytic coatings in this country are those produced in the sulphuric and the chromic acid baths. In these baths, the parts to be treated form the anode in the bath and are processed for varying lengths of time depending upon the thickness of oxide film required. This thickness determines the ultimate corrosion resistance. The films are composed chiefly of aluminum oxides, which are high in abrasion and corrosion resistance and have good insulating qualities.

The resultant films are treated in hot water or a dichromate solution which seals the coating and prevents staining. Thickness of the film formed is between 0.0001 and 0.001 in., with an average of about 0.0003 in. A comparison of the anodic processes is found in Table II.

From an equipment standpoint in both processes, it is necessary to know what type of stock is to be anodyzed as different stocks draw different current densities. This is illustrated in Fig. 8, which gives the voltages and the peak and average current densities that are had in both the sulphuric and chromic acid processes in a nickel tin alloy and a silicon copper alloy. Using chromic acid, note the high current density on the nickel tin alloy. The peak current which is had is 147A/ft² while on the silicon copper alloy it is 55A/ft². In the sulphuric bath, with its low voltage, the maximum current is 50A/ft² with a leveling off current of approximately 36A/ft² in one case and 10A/ft² in the other.

Chemical Treatments for Aluminum

Of the chemical treatments for aluminum, those commonly used are the chromic acid type, phosphates and alkaline dichromates. These processes differ from the anodic processes in that no electrolytic equipment is needed and the processing time is generally shorter. They do not, however, possess the corrosion resistance nor the abrasion resistance of anodic films.

For the most part, they are considered as bases for paint. This is not universally true as the photographs will show. We have used the Alrok process of the Aluminum Company of America on some parts and have obtained up to 2,000 hours salt spray resistance on uncoated parts. The final corrosion depends on the part being processed, the amount of casting scale, the preprocessing of the part, and finally, the operating conditions of the bath. Phosphating is likewise being used for the treatment of aluminum, but it is used only as a base coat for paint.

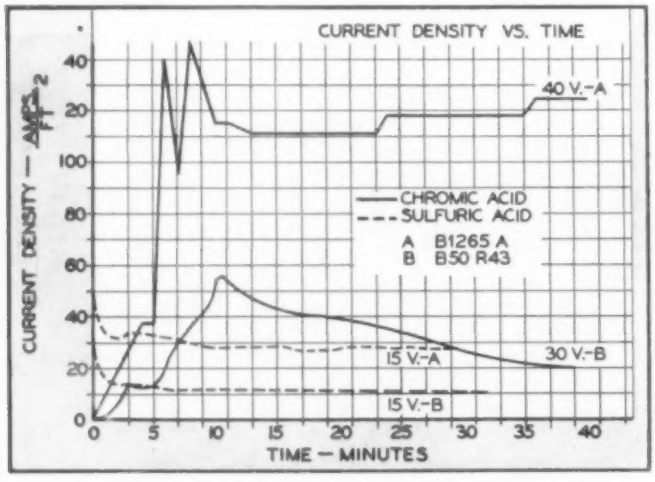


Fig. 8. Illustrated above are the voltages and peak and average current densities encountered with both the sulphuric and chromic acid processes using a nickel tin alloy and a silicon copper alloy. In both baths the nickel tin alloy shows the high current density.

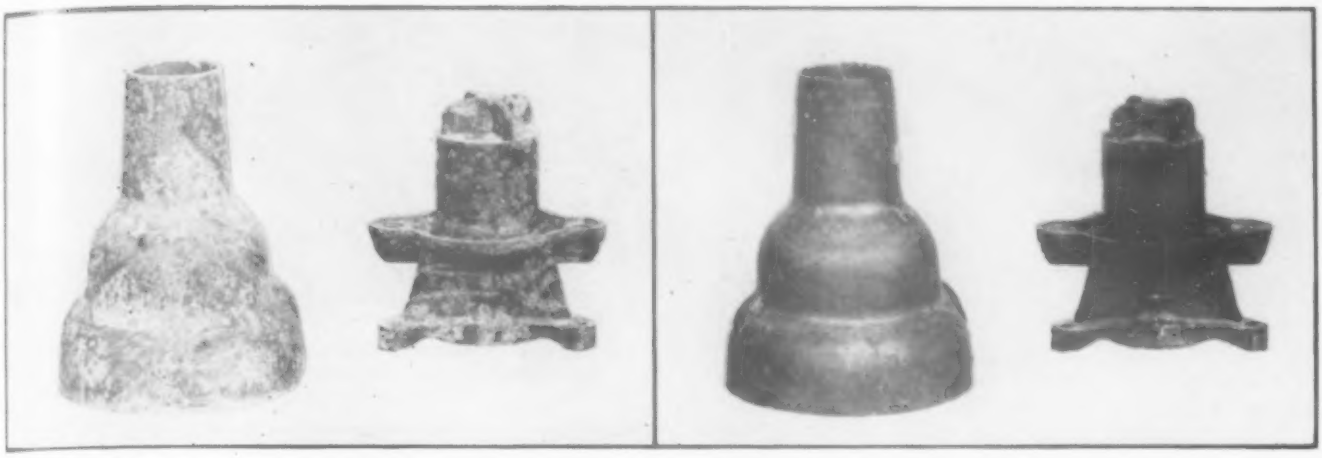
Comparison of Coatings

Alodine, a process of the American Chemical Paint Company, is likewise used extensively in the protection of Aluminum. This has a decided advantage over some types of coatings in that the processing time is short. We have no experience with this type coating on anything but cast stock.

A comparison of these coatings is shown in the following paragraph. Bear in mind, however, that this information is pertinent only to the parts processed and may not hold true in all cases. In any chemical or electro-chemical process for aluminum, whether it is Alodine, Alrok, or Anodyzing, a cycle must be set up in order to obtain maximum corrosion protection resistance.

TABLE II—COMPARISON OF ANODIC PROCESSES

	Sulphuric Acid	Chromic Acid
Electrolyte (%)	15-25	5
Temperature (deg F)	68-72	95 ± 5
Current Density A/ft²		
Sheet Stock	10-20	
Cast Stock		
Copper Silicon Alloy	15	35
Nickel Tin Alloy	50	200-300
Volts	10-20	30-40
Processing Time (Minutes)	10-30	30-60
Thickness of Films (in.)	0.0001-0.001	0.0001-0.001
Reported Weathering as		
Salt Spray Resistance	1 year	6 mos. +
Sheet Stock		
Uses	Sulphuric Acid	Chromic Acid
	Where maximum protection is required	Where dimension change is important
	Where change in dimension is not important	Inspection tool shows porosity
	Should not be used where acid can be trapped	Can be used where acid can be trapped



After 143 hr on the salt spray test the above castings were completely corroded.

The above castings were subjected to the salt spray test for a total of 1453 hr.

Fig. 9. A comparison of the corrosion resistance of a phosphate treated die casting and that of an Alrok treated casting is shown here. It should be noted that the phosphate coating is used primarily as a base for painting, rather than as a final finish.

Fig. 9 shows a comparison of the corrosion resistance of the phosphate treated die casting after 143 hours on salt spray and that of an Alrok treated casting after 1453 hours. The former coating as noted is used primarily as a base for paint and these parts are unpainted. This picture would indicate that the Alrok film is certainly more than a base coat for paint and offers considerable corrosion resistance in itself.

A comparison between an Alroked and Anodyzed sand cast part is shown in Fig. 10. The parts were on test 694 hours. Note the superiority of the Anodyzed part over the Alroked part and that of the Alroked parts over the untreated one.

Corrosion Resistance

Fig. 11 shows a comparison of the corrosion resistance after 300 hours in salt spray of various treatments for aluminum both as a base for paint and as a protective treatment. Note the condition of the Alroked piece.

Apparent discrepancies in the salt spray resistance of the various coatings can be explained in that the surface preparation prior to processing govern the final corrosion resistance. Note the corrosion on the anodyzed part in this photograph. This was a die cast part in which the casting skin was not removed prior to anodyzing. It should also be pointed out that casting scales differ and in some cases need little or no oxide removal, while in other cases results are not too important if the parts have not been deoxidized.

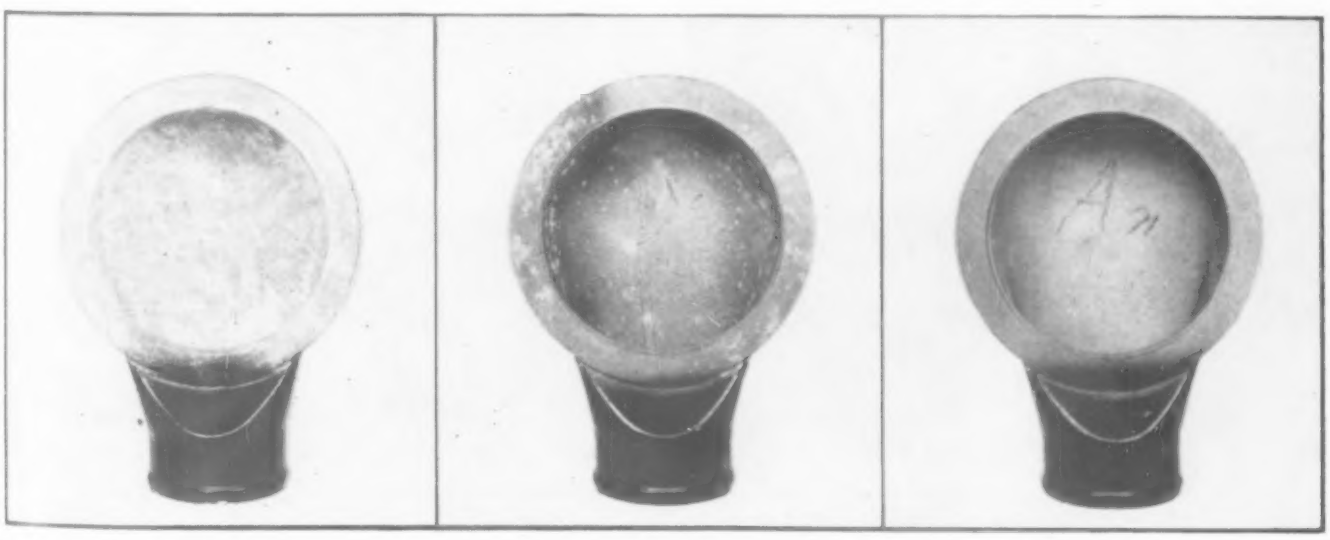
Processing and Magnesium

No suitable coating is available for magnesium which will match in corrosion protection the films formed on aluminum. Research is continuing and it is hoped that such a coating will soon be available.

The most commonly used method of protecting magnesium is by a suitable HF acid precleaning process followed by a dichromate treatment. In no cases is much over 100 hours salt spray resistance obtained on an unpainted film without showing some signs of corrosion.

Fig. 12 shows magnesium castings after 177 hours on salt spray. Note the upper left endshield and compare it with the lower right. The former is unprotected while the latter has been dichromate treated and primed with a zinc chromate primer. The intermediate samples progressively show more corrosion resistance than the untreated ones.

The main corrosion troubles with magnesium occur when it is in contact with other metals and electrolytic corrosion results. Fig. 13 shows two magnesium endshields after less



No Treatment | Alrok | Anodyze (Sulphuric)

Fig. 10. An Alroked and an Anodyzed group are compared here in a salt spray test which comprised testing in a 20 percent salt solution at 95 deg F for a period of 694 hr.

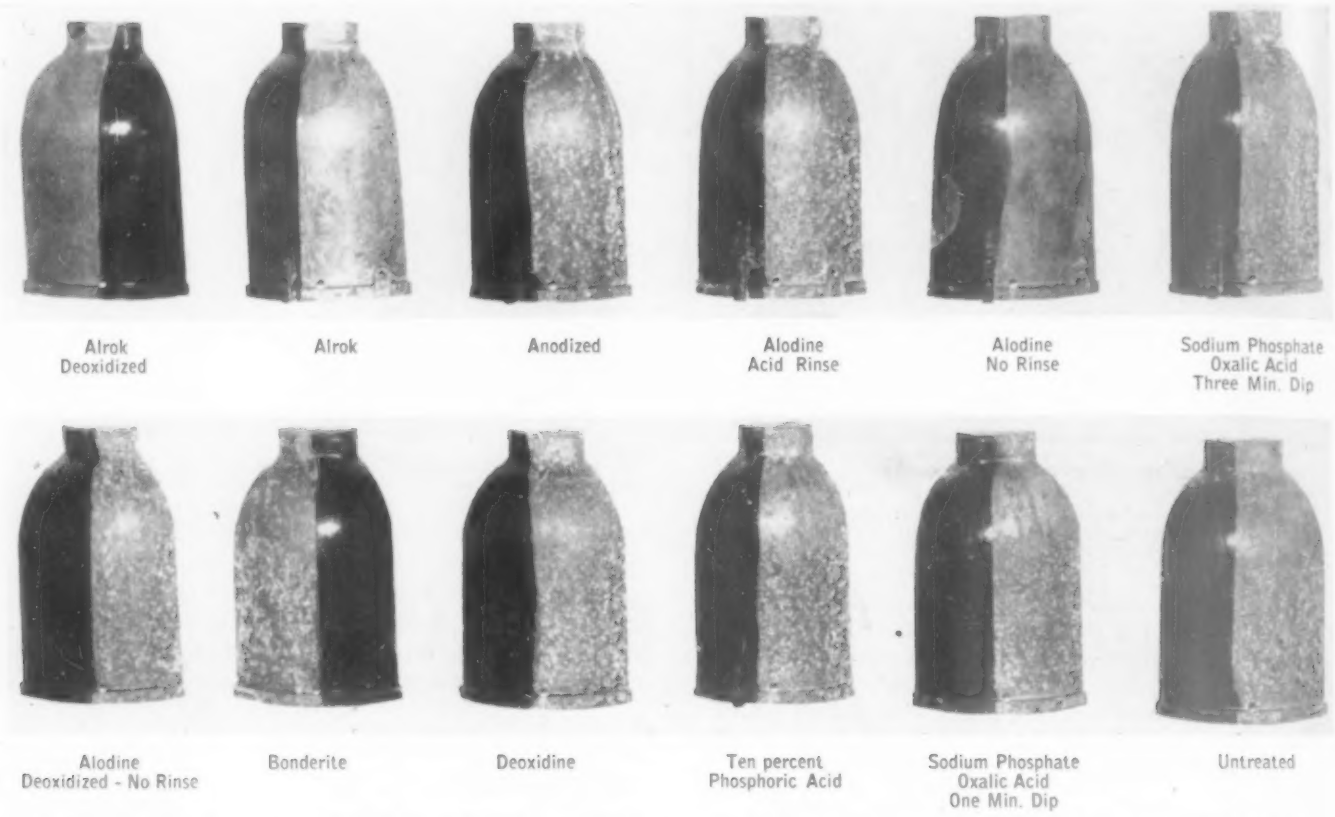
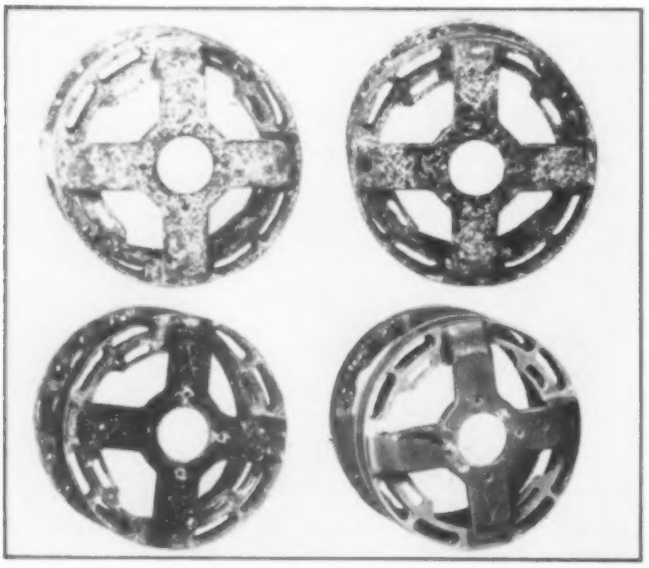


Fig. 11. The test effects on corrosion resistance of various treatments for aluminum, both as a base for paint and as a protective treatment, are shown above. The salt spray test was conducted for 300 hr, and only one-half of each part was treated.

than 100 hours in salt spray. Note the difference between the right and left endshields. The cadmium plated hardware contact areas on the right specimen are completely corroded and the hardware has fallen off. In the left endshield almost 100 percent protection is had with an insulating paint barrier between the magnesium and the inserts.

While no effort has been made to discuss in detail the processes mentioned above, we have however attempted to point out some of the highlights in each and where possible to show their equipment requirements. The test data presented should serve only to emphasize that the final corrosion resistance of a process depends on many preprocessing factors which must be considered prior to the selection and installation of that process.

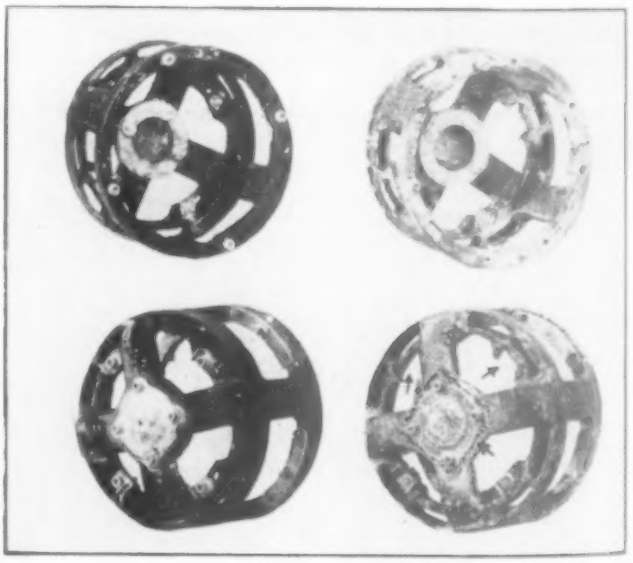
Reprints of this and other technical articles appearing in The Tool Engineer are often available at cost. It is necessary, however, to request such reprints promptly.



Untreated
Dichromate Treated

Zinc Chromate Primed
Dichromate Treated
Zinc Chromate Primer

Fig. 12. Effect of 177 hr exposure to salt spray on magnesium castings. At upper left and lower right are extremes in the test; former is untreated, while latter has both dichromate treatment and zinc chromate primer.



Dichromate Treated
Primed
Finished

Dichromate Treated

Fig. 13. Electrolytic corrosion effects on magnesium are illustrated in the test shown above. Note contact areas where cadium-plated hardware joins the magnesium parts. At left almost complete protection is obtained, while at right corrosion is advanced.

By J. W. Lengbridge

34-92000

Cutting Loads in Punch Press Tools

Installment No. 13 of a Series on the Theory and Practice of Pressing Aluminum

THE PRESSURE REQUIRED to make a cut on a piece of metal depends on the strength of the material and on the area through which the cut is made. Resistance of the metal to cutting varies with the kind of material and its temper. The area to be cut is the product of the length of the cut and the thickness of the material, and the maximum pressure which can occur is:

$P_{max} = L \times T \times S_s$; in which L is the cut in inches, T the thickness of the material in inches, and S_s the shearing strength of the material in psi.

In this formula, which is usually used in cutting pressure calculations regardless of the effect of shear on the tools, because it allows some margin of safety, it is assumed that the punch must cut through the entire thickness of the material —a condition necessary only under extreme conditions of insufficient clearance. When tools are ground with shear, or when punches are staggered in piercing operations, the actual pressure will be less than $L \times T \times S_s$. But, since tools become dull and cause a rise in the cutting load, it is advisable to use the maximum pressure formula in calculation.

Tool Penetration and Shear

Given correct clearance and keen cutting edges, the metal is cut through only part of its thickness. The rest is broken through. The portion of the thickness actually cut by the tools is the depth penetrated by the punch. This depth varies with the metal, but is usually greater on soft metal. Typical values, in terms of a percentage of metal thickness for some of the alloys of aluminum, are given in Table 13.

The pressure required to overcome resistance to cutting through a given area may be high when there is insufficient clearance between the cutting edges, and when the cutting edges are dull. The pressure may be decreased in two ways: First, by increasing the clearance, although there is a specific range within which clear cuts are obtained. Increase beyond this range will cause distortion of the work. Second, by reducing the area being cut at any one instant. This is done by grinding the cutting edge at an angle—or, as it is termed, putting "shear" on the tool.

When the cutting edges of the punch and die are parallel, cutting action takes place along the entire periphery of the cut at the same instant. Involving maximum cutting loads, this condition may tax the capacity of equipment on long cuts through thick, strong material. To reduce the cutting loads, shear may be ground on the tools as suggested by Figs. 117, 118 and 119, which show punch-die combinations with and without shear, supplemented with load diagrams.

Because shear on the die and punch tends to respectively distort the stock and punching, it is important that shear be provided on the proper tool member. If flat blanks are required, shear must be on the die, and if the piercings are scrap and the stock required to be flat, then shear would be incorporated in the punch. In either case, the shear should be balanced to prevent side thrust which would cause creeping of the die or deflection of the punches, thereby reducing the clearance on one side. Balanced and unbalanced shear are shown in Fig. 120.

If ground with angular shear, small slender punches tend to skid on the stock and, as a result, may bend or break. When piercing groups of holes, therefore, it is usual practice to stagger the punches as shown in Fig. 121. This staggering has the same effect as shear although, for smooth cutting action, the punches should differ in length only an amount

TABLE 13—TOOL PENETRATION IN CUTTING

Relative Hardness	Alcan Alloy		Depth of Penetration
Soft	2S-O	3S-O	25%
Medium	2S-H	3S-H	15%
Hard	17S-T	24S-T	10%

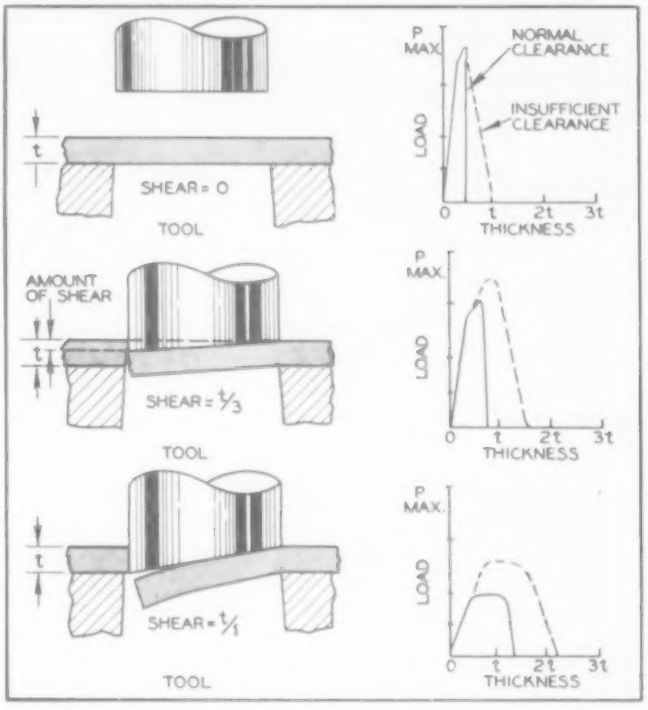


Fig. 117, top, shows a cutting operation in which the cutting edges are parallel—that is, shear is zero. Stock thickness is indicated by "t". Since the cut takes place on the entire periphery at once, it is obvious that the operation will entail maximum load. The load diagram at right shows the rapid rise at maximum pressure, then the sudden load release—sometimes severe on both press and dies—as the cut is completed.

Fig. 118, center, shows a punch ground with shear. If the punch were to be ground so that the height of the angle equals 1/3 of the metal thickness—that is, shear equals t/3—, its leading edge would start cutting before the rest of the punch made contact. With this condition, only part of the punch would be cutting at any one instant. While cutting load would be less, the punch would have to progress further through the stock to complete the cut. With the punch in position shown, cutting pressure would be at maximum for this amount of shear, and because the cut is more or less complete the total cutting load would be less than that required for the condition shown in Fig. 117. Pressure is slightly less than when shear is zero, but as the work done is the same the distance through which pressure applied is greater. Load release is also somewhat less sudden.

If, taking a step farther, shear is ground on the punch so that the height of the angle equals the full thickness of the metal cut, as in Fig. 119—bottom—the shear would be equal to "t". When the leading edge Y has progressed entirely through distance "t", opposite edge Z is just making contact with the metal. Maximum pressure would be at this position of the punch, and since most of the cut is complete the total load would be about half that required when shear is zero. The distance through which the punch load functions is greater still than that indicated in Fig. 118.

Footnote: These articles are a collaboration between the author, Mr. Lengbridge, and Aluminium Laboratories, Ltd., of Kingston, Ontario.

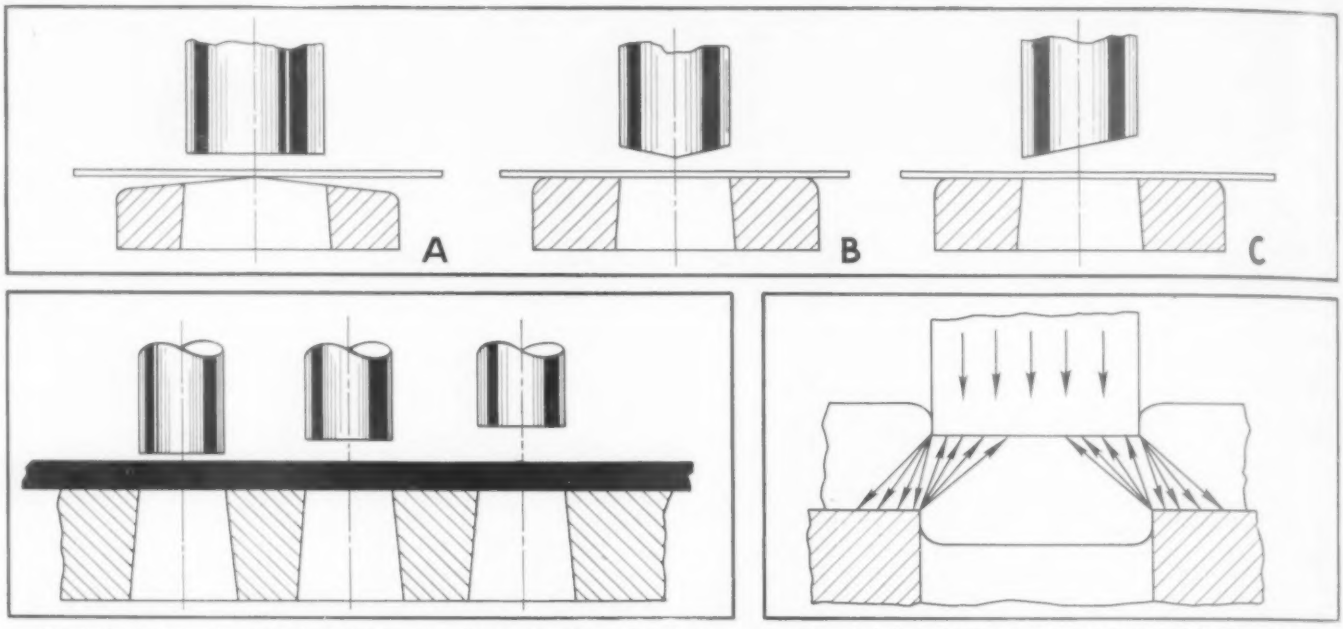


Fig. 120—at top—shows, at A, a blanking die with 2-point shear. The blank will be flat. At B is a piercing punch with balanced 2-point shear, while C shows a piercing punch with one-way shear and therefore unbalanced. In both of the latter arrangements the punchings will be distorted and the stock flat. Fig. 121, at lower left, shows a staggered arrangement of punches to reduce cutting load. Each succeeding punch is shorter than the preceding by the thickness of the stock. Fig. 122, at lower right, illustrates distortion around pierced holes due to outward components of the cutting loads. The arrows indicate the components of vertical force.

equal to the depth of penetration. If the steps are too great, the result is a jerky series of loads and releases.

When applied in a vertical direction, cutting load has a pinching effect on the metal located between the cutting edges. This exerts an outward force on the metal adjacent to the cut, as shown in Fig. 133. To avoid this, ample clearance should be allowed in addition to staggering the punches as stated. This holds particularly when piercing groups of closely spaced holes, as it has the effect of reducing the cutting load as well as its outward component.

Shaving

In punch terminology, shaving refers to an operation in which a pre-cut edge is made smooth by removing a small amount of metal from the face of the cut edge. Referring back to Fig. 109-C—Installment 12, April issue—it will be noted that the cut edge is smooth on the cut band, and rough on the break. This roughness may be objectionable for certain press products, both blanked and pierced.

While a machining or reaming operation may follow blanking or piercing in rare cases, a press product requiring perfectly smooth edges or holes can be shaved to obtain the required finish. To allow for shaving, blanks and holes should respectively be made slightly oversize or undersize. Small cams, pawls, watch gears, and calculating machine parts may be shaved to extremely close limits of accuracy.

For best results, the amount shaved must exceed the amount of "break" on the edge. This may necessitate more than one shaving operation. Dies must be carefully made, well guided, and the edges kept keen; also, press speeds must be slower than for blanking operations. Fig. 123 shows, at A, a blank with the "as blanked" size, with dotted lines showing first and second shaving steps. Details B and C, at right, show the need for shaving operations when smooth parallel walls are required on a cut edge.

Because clearance varies with the metal thickness, the amount to be shaved off also varies with the metal thickness. This amount, as well as the finish required, may necessitate more than one shaving operation to produce the required results. Shaving allowances are given in Table 14.

The radius on the edge of a typical blank may be sharpened somewhat by shaving in the opposite direction to blanking. Or, if perfectly square corners are essential, the blank may be swaged before shaving, although at some sacrifice to thickness. For extremely fine finishes, a round-edged die 0.001 to 0.0015 in. "small" may be used after shaving. Forcing the blanks through a die like this produces a highly burnished finish on the edge.

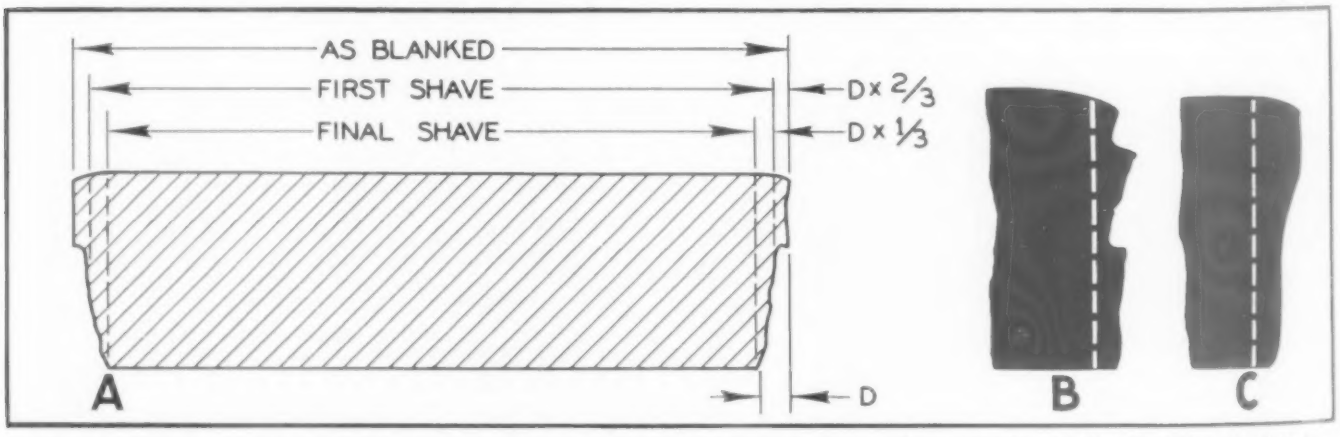


Fig. 123, showing the amount of metal to be shaved to obtain a finished edge. A shows a blank with the "as blanked" size, with dotted lines indicating 1st. and 2nd. shaving steps. B and C illustrate the need for shaving operations when smooth parallel sides are required on the cut edges.

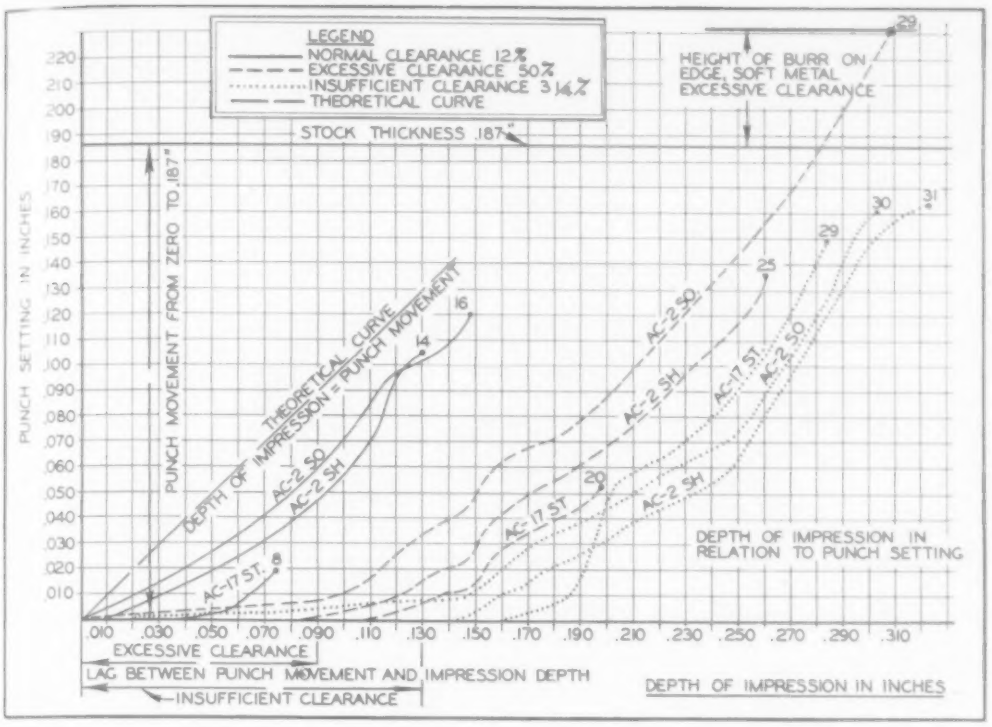


Fig. 124, showing results of tests on Alcan soft, medium-hard and hard aluminum alloys. The curves shown are taken from the punch settings and depth measurements of each impression. Looseness in the press caused back-up when the punch made contact with the metal, resulting in a lag between impression depth and punch setting. Evident on all test pieces, this lag is particularly noticeable under conditions of excessive and insufficient clearance. While there should be no substantial lag under ideal laboratory conditions in the curves for normal and insufficient clearance—punches 2 and 3—some lag would be expected with excessive clearance, punch No. 1. With excessive clearance, cupping occurs before penetration, and spring-back of the metal in the cupping stage would result in a lag between punch setting and impression depth. In the test, the press ram was brought to the stroke-down position and adjusted until punch No. 1 just touched the stock without applying any load. This is the zero impression indicated by the vertical line. The punch was lowered 0.010 in. down, the stock moved to Station 1, an impression made, when the punch was adjusted down in increments of 0.010 in. as the stock moved from station to station. One impression was made on each grade of metal before the setting was changed for the next.

TABLE 14—SHAVING ALLOWANCES IN INCHES

Thickness	1st. Shave Allowance	Final Shave Allowance
0.03	.....	0.004
0.05	.....	0.006
0.06	.....	0.007
0.08	0.007	0.003
0.100	0.008	0.004
0.125	0.010	0.005
0.175	0.013	0.007
0.250	0.020	0.010

Since it suggests different grades of edge finishes, shaving brings up the question: What is a standard finish? As accepted by the trade, good standard finish on most cut edges is one which is free from burrs and which can be cut with a minimum load. Generally speaking, the load decreases as the clearance increases; however, there is a point where the clearance may be so great as to cause burrs on the edge of the cut. For a standard-edge finish, therefore, clearance must be sufficient to allow the metal to fracture, yet without permitting burrs to form. To satisfy these conditions, the clearance is usually enough to show clearly the three characteristics of the cut—namely, the slight rounding of the corners, the cut band, and the break.

A shaved edge presumes a special finish sometimes necessary because of accuracy requirements, or because of the nature of subsequent operations on the blank. However, a cut edge with a very definite burr is also sometimes a desirable condition. While this might normally be considered a poor cut, it is a special edge finish often used as an aid to a subsequent curling operation.

Flow Study and Test Details

The introductory section on Cutting, Installment 12, outlined the three fundamentals of press cutting. First, deformation of the material into the die opening; penetration of the punch into the material; and the fracture which completes the separation of the slug or blank from the stock. Second, the resultant characteristics—as a rounding of the edge where deformation occurs; a cut band where the punch penetrates the metal being cut; and a rough or torn condition where the slug breaks away from the parent metal. Third, it stressed that the clearance between the cutting edges was the main factor controlling these characteristics.

Since the act of cutting metal in a die is usually arranged to completely separate the slug in one rapid blow of the punch, it is seldom possible, except in laboratory tests, to observe the three fundamentals and their characteristics separately. Therefore, in order to study the mechanics of a cutting operation on aluminum in greater detail and under different conditions of clearance, a comprehensive test was undertaken. The results are outlined below.

The alloys selected for test were Alcan 2S-O, 2S-H, and 17S-T, representing soft, medium-hard and hard metals in the order stated. In all cases, the metal was 3/16 in. thick and the clearance, expressed in terms of a percentage of the metal thickness, was 50, 12 and 3½ percent, respectively representing excessive, normal and insufficient clearance. The tools used consisted of one die and three separate punches—Nos. 1, 2 and 3—to provide three clearance conditions as detailed below.

PUNCH NUMBER	1	2	3
Clearance designation	Excessive	Normal	Insufficient
Die Diameter, inches	1.260	1.260	1.260
Punch Diameter, "	1.072	1.216	1.248
Dia. difference "	0.188	0.044	0.012
Clearance "	0.094	0.022	0.006
Metal thickness, "	0.187	0.187	0.187
Clearance, percent	50	12	3½

The press used was a single-action arch type of 75 tons capacity; however, this press was a well-used production machine in nowise comparable with laboratory test equipment. A certain amount of looseness in the crankpin and bearing, as well as in the adjusting screw, resulted in a lag between impression depth and punch setting, as shown in the chart, Fig. 124. The curves shown are taken from the punch settings and the depth measurements of each impression.

Nine test pieces were used and tested in groups of three—Alcan 2S-O, Alcan 2S-H, and Alcan 17S-T. The first group was cut with tools having excessive clearance, using punch No. 1. The second group, cut with normal clearance, used

punch No. 2, and the third, with insufficient clearance, used punch No. 3. As photographic reduction of all test pieces would render the impressions difficult to see, only the second of these groups is shown here. Since, in all cases, the punch was first brought down to just touch the stock, as indicated at O, and successively lowered in increments of 0.010 in. until penetration occurred, this group may be considered typical of all.

Examination of the progressive impressions on each test piece cut indicates that clearance is an important factor in determining the type of cut edge obtained, as well as the extent of punch travel through the stock necessary to cause separation. The conclusions are briefly summarized:

1. Effect of excessive clearance. (a) Separation occurred with less punch travel as the hardness of the metal increased. Thus, separation occurred at Sta. 29 on Alcan 2S-O; at Sta. 25 on 2S-H, and at Sta. 20 on 17S-T. (b) Deformation of the metal was most pronounced on the soft metal, the harder metal indicating a resistance to deformation. Depth of the first impression on Alcan 2S-O was 0.002 in., whereas the next two grades did not show a permanent set until the 11th and 12th impressions.

2. (a) With normal as with excessive clearance, spearation occurred with less punch travel as hardness increased, and at an earlier station—as, for example, at Stations 16, 14 and 8 in the order of hardness. (b) Deformation of the metal before the punch started to cut was less pronounced with normal clearance, although following the same trend. (c) Progress of the punch through the metal was more or less proportional with the punch settings, indicating that the clearance used was sufficient to permit fracture to take place without the excessive deformation from excessive clearance or the crowding from insufficient clearance.

3. With insufficient clearance, separation occurred at about the same impression of all three types of metal. This suggests that, with insufficient clearance, the material does not break but is cut almost through the full stock thickness before separation occurs.

Flow Through the Cutting Cycle

The term flow is readily understood in connection with drawing and forming operations where the shape of the metal is being changed. In cutting operations, no material change in shape takes place, but flow of metal does occur. In order to observe this flow under correct conditions of clearance, sections were cut through various impression stations on those test pieces cut with punch No. 2, and photomicrographs made at 50x magnification. See Figs. 126 and 127, which supplement test pieces 4 and 5, Fig. 125.

With Alcan 2S-O and 2S-H, it was possible to take a series of sections showing the progressive flow as the punch moved through the stock. With Alcan 17S-T, however, separation occurred so quickly, and with only slight punch penetration, that it was practically impossible to obtain a picture of progressive flow of this metal. Separation occurred with so little deformation that only the impression immediately preceding the first free-cut blank was sectioned. The last unseparated impression of each type of metal cut with punches 1 and 3 were also sectioned for comparison with similar sections cut with punch No. 2. Since, however, Figs. 126 and 127 may be considered typical of the entire series of pictures, these are not shown here.

Clearance An Important Factor

Throughout this discussion, emphasis has been placed on the importance of using correct amount of clearance, on cutting tools, in order to obtain clean cuts with minimum loads. Clearance also has a decided bearing on the flow of metal in a cutting operation. Excessive clearance results in too much flow, while insufficient clearance prevents flow except in a concentrated area. The latter condition results in a crowding of metal which prevents normal fracture.

With regard to excessive clearance, test piece No. 1—Alcan 2S-O—can be cited as an example. With clearance 50 percent of the stock thickness, the depth of impression No. 28 was 0.200 in. Yet, while this was in excess of stock thickness, the slug was still securely attached to the stock. For while the actual penetration of the punch into the metal was less than 0.200., the excessive clearance permitted a certain amount of forming to take place before the punch cut into the metal. When the slug finally separated from the stock, this formed portion was dragged over the edge of the die and resulted in a burr around the cut edge.

On the common alloys of aluminum, cuts with insufficient clearance—that is 3½ percent—prevented separation from occurring with a single fracture. When cut with insufficient clearance, the edge showed two or more bands of metal through which the punch had to cut before separation occurred. At an impression depth of 0.157 in., for example, fracture as not apparent although this represents roughly 80 percent of the stock thickness. Further punch penetration would be necessary for separation.

The results of all tests can be summarized as follows:

1. Deformation increases as hardness decreases. This is indicated by the size of the corner radius on the upper face of the stock, where the punch makes contact, and on the lower face of the slug which is pushed through the die.

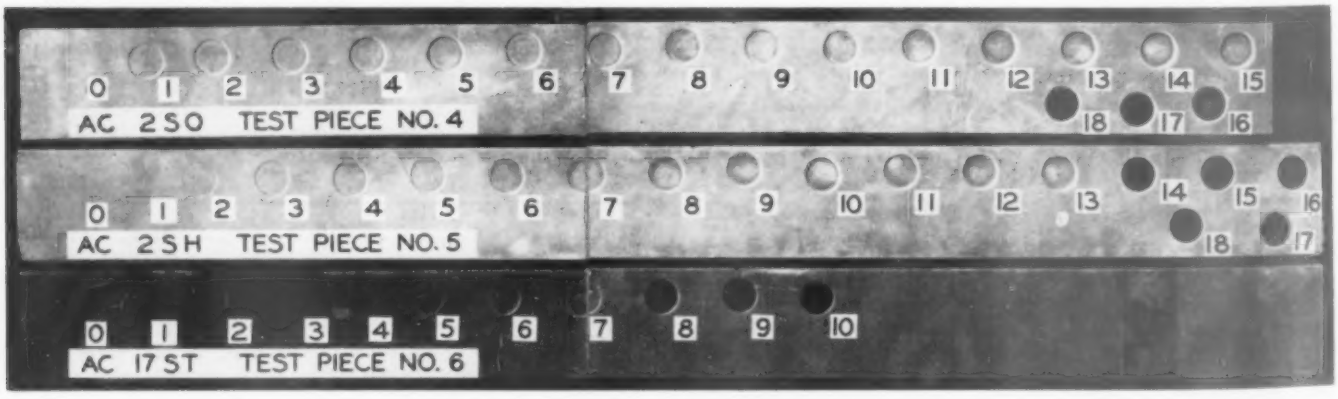


Fig. 125, illustrating results of tests on nine test strips arranged in groups of three. Each group consisted of one each strips of Alcan 2S-O, 2S-H, and 17S-T, or soft, medium-hard and hard, in the order stated. The first group of three was cut with tools having excessive clearance, the second with normal clearance, and the third with insufficient clearance. Only the second group is shown here. In testing each group, the punch was brought down to just touch the work, as at 0, then brought down in increments of 0.010 in. until full separation occurred. The results of the steps are indicated by the successive deepening of the impressions, here numbered from zero to one or more points of separation. On some test pieces, one or more slugs preceding the separation point could be pushed out by hand, on others they dropped out when the saw cuts for the sections were made. In other words, the slugs at these stations were actually separated but were held by wall friction and would require further punch travel to push them free. In test piece No. 4, complete separation occurred at Station 16; in test piece No. 5, at Station 14, and in test piece No. 6, at Station 8.

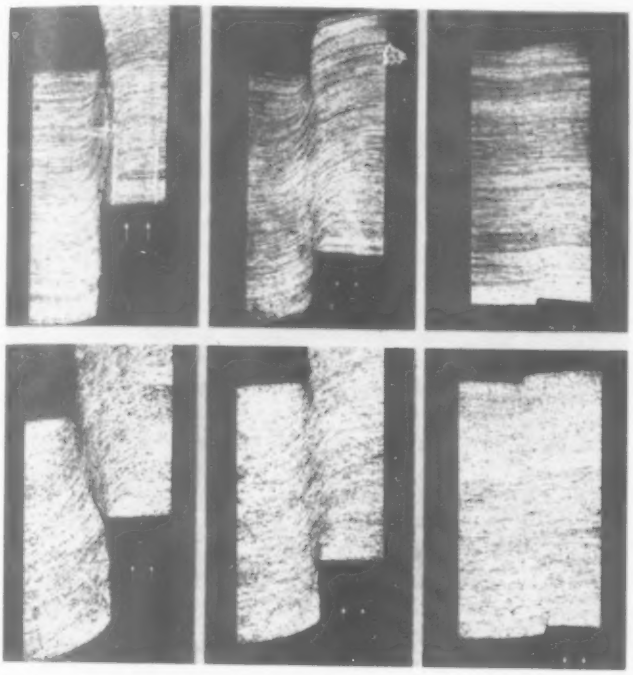
2. The depth of punch penetration, to the point where fracture starts, decreases as the hardness increases and may be measured by the width of the cut band.

3. The break area is smoother on hard metals than on soft metals.

4. Excessive clearance causes metal to be formed into the die opening before cutting starts, resulting in edge burrs.

5. The correct amount of clearance permits fractures to occur with minimum burring.

6. The amount of punch travel necessary for separation increases as the clearance decreases; also, the burnished area on the cut edge increases with decreasing clearance. In extreme cases, the burnished area indicating the amount of shearing done by the punch may appear on the entire area. A good example is to be found on collapsible tube slugs, such as punched out at the Kingston Works. These slugs are cut with almost zero clearance to produce a fully burnished edge. A typical case would be a ⅜ in. thick slug cut with 0.0005 in. clearance, which is about .3 percent. In this test, the clearance designated as insufficient for a standard cut edge amounted to 0.006 in., or 3½ percent of the stock thickness used.



Figs. 126 and 127—top and bottom, respectively—are photomicrographs of sections of test pieces of which Fig. 125—test pieces 4, 5 and 6—shows typical examples. Fig. 126 hows progressive flow of metal in the cutting operation on Alcan 2S-0—test piece No. 4—with normal clearance of 12% and at three different stages of the cutting cycle. In all photos, the arrows indicate the direction of punch pressure. The first evidence of flow is seen at A, a section through impression No. 3, Fig. 125. Here, the punch has made a permanent impression 0.020 in. deep in the upper face of the stock and has pushed out a pad 0.020 in. high in the lower face.

The next stage of flow—at B—is a section through impression No. 10, having a depth of 0.075 in. In this section the flow lines show a definite change in direction from the horizontal through the shearing area, especially where the sharp edges of the tool contact the metal. The rounding of the edge where the punch entered may be seen, the small cracks showing at the upper and lower corners indicating that the fracture is just beginning to take place. At C, a section through impression 15—the last unseparated slug—which measures 0.120 in. deep. The fractures have moved toward each other and the slug is almost separated from the stock. With the punch set only 0.010 in. lower at Sta. 16, complete separation occurred. This indicates that, with correct clearance, the punch does not have to penetrate the full stock thickness to complete the cut. In practice, the punch is usually arranged to enter the die, but simply to push out the slug. In this case, however, the punch had moved through 2/3 of the stock thickness to complete stock separation. Edge radius, cut band, and the break are all clearly defined in the section.

Fig. 127 shows results of a similar test on Alcan 2S-H, test piece No. 5, Fig. 125, also with normal clearance. The first impression sectioned—No. 3, at A—measured 0.010 in. deep—considerably less than at Sta. 3 on the 2S-0 grade. Even at this shallow depth, however, some flow is apparent. The next section, B, taken through impression No. 10, is similar to impression 10 on the 2S-0 except that the rounding of the corners is much less pronounced. This impression measured 0.060 in. deep, which is less than the corresponding impression on 2S-0. While the fractures are just beginning to show, they are not so clearly defined as those in Fig. 126. Section C is through impression 12 and measures 0.060 in. deep. Section C, Figs. 126 and 127, have one thing in common; that is, the metal fibres through the cutting area are almost vertical. In other words, they are parallel to the centerline of the load and are therefore being stressed in tension.

Fig. 128, a photomicrograph at 150x of effect of insufficient clearance on Alcan 17S-T. This view suggests that there is a work-hardened area around the edge of the cut. The grain contour is elongated on each side of the break.

Lubrication

AT THIS POINT, and especially as we are nearing the end of this Series, a brief discussion on lubrication will serve to bridge forming and drawing operations, previously discussed, and cutting operations discussed here. For as previously implied, lubrication ranks next in importance to tool design and construction for the efficient production of pressed metal parts. This applies to almost all press operations.

In cutting operations, pierced holes will plug rapidly and work will not strip freely if work or tools are not properly lubricated. In forming and drawing—operations involving flow of metal—the dies will score and "pick up" if the moving surfaces of the work are not well lubricated wherever they come in contact with the tools. While almost any machine oil will serve for cutting operations of an average nature, a better lubricant may be necessary for rather heavy cuts. But for even the simpler drawing operations, the best available lubricant for the particular metal being worked is a good investment.

Friction between two solid surfaces may be of two distinct kinds: solid friction, as when the surfaces are in actual contact; and fluid friction, when the surfaces are separated by a film of lubricant. In a drawing operation, there may be a condition of fluid friction at the start of the draw, changing to a combination of fluid and solid friction and even to solid friction as the draw proceeds and the pressure increases.

The trouble arising from unsatisfactory lubrication can be divided into three kinds, with results as follows: (1) Scoring of the work and loading the tools. (2) Fracture of the work because of friction in the flow area causing abnormally high tensile stresses in the drawn area. (3) Uneven flow of metal because of uneven application of the lubricant.

Requirements and Types of Drawing Lubricants

The essential requirements of a good lubricant are as follows: (1) Highest possible film strength to prevent metal contact between the work and the die, which would cause scoring and "pick-up". (2) Medium coefficient of friction to prevent the metal moving too freely into the die. If the coefficient of friction is too low the metal slips too freely and results in uneven or wrinkled draws. If too high, it does not move freely enough and may cause pinching. (3) Lowest surface tension to allow it to spread rapidly. (4) Solubility for ease of mixing. (5) Non-toxic effect on workmen, for reasons of health. (6) Ease of application and removal, for reasons of cost. (7) Freedom from odor, to avoid annoyance to operators. (8) Color. This is sometimes important on certain work when parts of a blank are to be lubricated only where required.

Type of Lubricants

Lubrication plays so vital a part, in deep-drawing operations, that production executives should thoroughly investigate the possibilities of some of the many trade lubricants available. It is poor policy to use one general lubricant for all metals, even for all types of drawing problems in one

Fig. 128, a photomicrograph at 150x of effect of insufficient clearance on Alcan 173-T. This view suggests that there is a work-hardened area around the edge of the cut. The grain contour is elongated on each side of the break.

metal. A lubricant which is excellent for steel may be poor on brass, and vice versa. Too thick a coating of certain lubricants will cause wrinkling on thin aluminum and yet draw a perfect shell when applied thinly and evenly. Much better draws are possible with a carefully selected lubricant, and with a little experimenting the inventory of lubricants can be reduced to just a few kinds. A few proven lubricants for use on aluminum are given in Table 15.

600 W applied on a blank will supply sufficient lubricant through several redraws. However, Kondor Draw tends to dry out if not mixed with an oil, and may necessitate a second application in order to keep the shells sufficiently lubricated through the redrawing. A good combination, which will stay wet, is 50:50 mix of 600 W and Kondor. The latter, mixed with water, is an excellent lubricant for single draws.

Lubrication of Lithographed Stock

Lubrication of decorated sheet metal, prior to its fabrication, is a problem because of conflicting requirements. For while a good lubricant—and plenty of it—is the all-important factor in extendingy die life and also the intervals between sharpening and redressings, copious lubrication softens

TABLE 15—LUBRICANTS FOR DRAWING OPERATIONS

Type of Work	Lubricant	Supplier
Light draws	Machine oil or Forum No. 40 or Amber Permo No. 7	Atlantic Refinery Imperial Oil
Medium draws	Graphite in soluble oil or Petrolatum or lard oil	B. A. Oil Co.
For severe deep draws	600 W or No. 140 Imp. Gear Oil or Kindor Draw No. 75	Imperial Oil, Ltd. Allied Indust'l Equip't Co.

TABLE 16—LUBRICANTS FOR DECORATED METAL

Type of Work	Lubricant	Supplier
Coated & lacquered seals	Liquid Gloss Finish Imperial Seal Drawing Oil	Atlantic Refinery Imperial Oil, Ltd.
Plain aluminum and Goldy seals	Imperial Seal Drawing Oil	Imperial Oil, Ltd.
Seals which must be from oil, and medium draws and perforated parts	Straight alcohol	
Scratch brushed metal	Castor oil 5% —alcohol 95% or Liquid gloss 10% —alcohol 90%	

the decorative coating and subjects it to abrasion and possible removal. It is highly important, therefore, to select a lubricant which will satisfy both functions at a cost compatible with economical operation.

Before deciding on any particular type, it were well to investigate the entire field—seemingly a large undertaking yet entirely worthwhile considering the benefits in terms of lengthened machine hours and reduction of scrap occasioned by soft decorations.

Lubricants for cap drawing should have the following characteristics: (1) Must be easy to apply and (2) able to lubricate high speed stamping. (3) Must not collect dust to a noticeable degree nor (4) exert any appreciable softening action on the decoration during or after stamping. (5) Must have minimum smearing tendency and (6) should polish to a smooth finish during hoppering. (7) Should be practically odorless, and (8) must be low in cost.

Apparently, these specifications have been drawn to the advantage of the decorator, yet, whatever a lubricant will do for decorations is valueless if it does not ease the coated metal through the dies. If decorated sheets are lubricated and subsequently piled in stacks, the pressure of the piled sheets is very great and tends to force the lubricant into the decorative coating. Suitable lubricants for decorated metal are given in table 16. It should be noted, however, that if decorated sheets are lubricated and subsequently piled in stacks, the pressure of the piled sheets, being great, tends to force the lubricant into the decorative coating.

Installment No. 14 will follow in June issue, THE TOOL ENGINEER.

EDITORS' NOTE

This Series on Aluminum Presswork, by Mr. Lengbridge, will be concluded in the July issue, The Tool Engineer. Immediately on the conclusion of the Series, reprints of all of the installments will be available, with such errors as may have occurred corrected in the Appendix.

In view of the importance of this work and the wide interest it has evoked in the trade, it is suggested that all those who wish reprints of the entire Series make application either before or immediately after publication of the final installment. While a generous supply of reprints will be struck off for distribution by The Tool Engineer, with additional sets no doubt available from Aluminum Laboratories, Ltd., it may be well to be among the "early birds". Sets will be mailed in the order of application.

The Editors

34-91000

Cutting Tools and Fixtures

By A. E. Rylander

Concluding Installment of a Series

HAVING PREVIOUSLY discussed milling and turning operations on the assembly used for case study in February and March issues, we will now conclude with comments on drilling, tapping and boring the part shown in Installment No. 8. As with all other operations, the cutting tools, fixtures and machine equipment used—or suggested for use—will depend largely on the quantity to be produced, the accuracy required, and the output per diem.

For example, the boring of the cross-hole—Fig. 1, in this installment—can be done in several ways. The simplest method, for comparatively low production, is to bore on a horizontal boring mill using two bars. One bar would rough and finish bore the hole and face the end. It would then be removed from the spindle and a second bar would perform a similar operation on the opposite end. Both bars should be guided in pilot bushings. As an alternative, one bar could be used, first boring one hole and then traversing to the opposite hole to bore both in one pass. However, a second or even a third bar would then be required to face the ends.

Another method would be to use a telescoping or jointed bar, as shown in the informal illustration, Fig. 1. This type permits boring and facing both ends of the bore with the same bar and in the same setup. While bars of this type would increase production somewhat, they must be carefully made and must further run in guide bushings to insure alignment. To use, one end is bored first, the leading tool-bit doing the roughing, the second the finishing cut. The latter bit engages as soon as the rougher is in the clear, and the facing cutter follows immediately after the finisher. After one end is bored and faced, the machine is stopped, the bar retracted, when the opposite end is bored and faced. All cutters work in the same direction.

A much faster method, and considerably more accurate, is to bore in an opposed-spindle precision boring machine, using stub bars. As a matter of fact, this would be the economical method for mass production. As far as setup is concerned, fixturing would be substantially as suggested by Fig. 1; that is, the part would be located on a locating plug, although good practice would indicate that the part be "squared" or positioned radially by means of a manufacturing hole in the flange. However, the drilled bolt holes could serve, or a dowel hole. Depending on quantity, clamping could be manual or automatic.

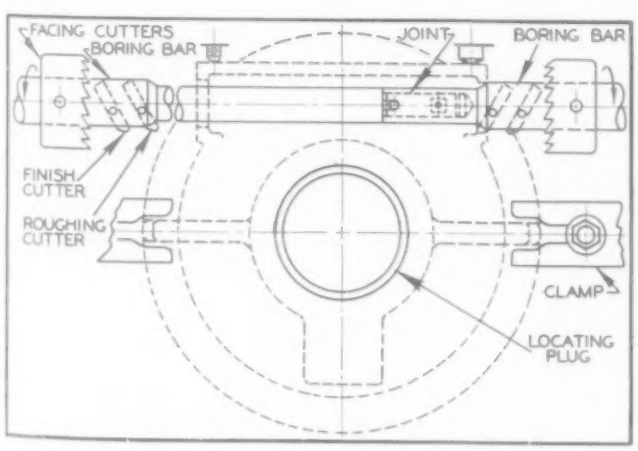


Fig. 1, showing a jointed boring bar, such as may be used to rough, finish bore and face both ends of a bore in the same setup and without exchanging bar. The finishing tools engage as soon as the roughers are in the clear, and the facing tool immediately follows the finisher. When one end is bored, the machine is stopped and the bar retracted to prevent scoring the bore. The opposite end is then machined. All tools rotate in the same direction. The objection to a boring bar of this type is that it must be carefully and accurately made so that there be no runout between the two components. A simple type of fixturing is indicated.

Drill Fixtures

Also depending on quantity, drilling, spotfacing, reaming and tapping of the holes on the several flanges—mating, circular, cross-hole, and at the broached hole—can be done in a number of ways. Shown in Fig. 2 is a simple drill fixture which would serve for limited production, the drilling being done on a light-duty bench drill.

Essentially, this fixture consists of a base plate, which is secured to the machine table; a rotable locating plug having a stepped and keyed extension, and a bushing plate keyed to the plug for radial positioning. A locator could be incorporated as shown in detail at left. The holes would be drilled one at a time, turning the bushing plate free-hand from hole to hole after which the part could be spot-faced on the opposite side of the flange by the simple use of a piloted spotfacer. No fixture would be needed for this operation, as the part could lay flat on the drill table.

For mass production, however, a multiple-spindle drilling machine would be used; in fact, multi-spindle drills would be indicated for all of the holes on all of the flanges although, where only four small holes are called for—as at the cross holes and adjacent to the broached hole—it is entirely probable that drilling one hole at a time would keep pace with the drilling of the larger multi-bank holes.

Here, too, fixturing would simulate the type shown in Fig. 2, although it may be advantageous in some instances to incorporate the bushing plate in the drill head. Where drilled holes are to be subsequently tapped, this procedure would be practically mandatory; also, a shuttle fixture would be indicated so that the part may be immediately shuttled to an adjacent tapping head.

Horizontal Drilling Lathe

In this connection, there is one type of machine which, used in mass production, offers marked economies where holes are to be processed from opposite sides. That is the horizontal opposed-spindle or opposed multi-head drilling lathe. Also, with a machine of this type, long holes may be drilled in almost half the time required for drilling from one end. Both spindles enter the work simultaneously; then, just before the drill points touch, one spindle kicks back while the other breaks through the hole.

If used for the drilling and spotfacing of the holes in the circular flange, as suggested by Fig. 1, the part could be loaded in a fixture and all holes drilled from the one end. Then, as soon as the drills have broken through, the drilling head retracts and the opposite head advances and completes the spotfacing. The entire operation can be automatic except for loading and unloading and, where output warrants, even this may be automatic.

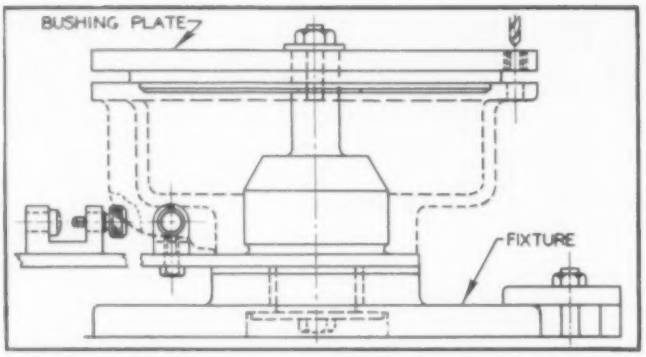


Fig. 2, showing a simple drilling fixture for multiple holes. A locating stud, provided with a stepped and keyed extension, rotates in a base plate which is clamped to the machine table. The bushing plate is detachable but keyed to the locating plug, and clamped against the workpiece through a U washer. To use, the part is loaded and one hole drilled at a time, on a bench type drill, by simply rotating the fixture hole for hole until all are drilled. Simple and inexpensive, fixtures of this type serve for low production or small-lot runs.

Mention was made, above, of bushing plates incorporated in the drill head. A typical example, although designed for a single-spindle rather than a multi-spindle drill, was shown in the Fundamentals of Tool Engineering for April, 1947, and is reproduced here as a "refresher". In connection with this head is shown a shuttle-type fixture, one station drilling and the other tapping.

It will be seen that the drill bushing in the yoke enters a bushing in the fixture, the I.D. of the latter being considerably larger than the tap diameter. Consequently, the tap enters the work without any interference from the liner bushings. Incidentally, these illustrations—here designated as Fig. 3—depict tools actually designed and used in production. In other words, the design is factual and practical.

One could go on indefinitely with the pros and cons of methods, especially so as older and what may be termed traditional practices are constantly being superseded with newer. For manufacturing economy, however, certain fundamental considerations apply to all phases of metal processing. These are, although not necessarily in the order stated:

1. That, as far as practical and as far as economy dictates, standard tools should be used in preference to specials. Standard tools have the advantage of lower first cost and quick replacement from stock. 2. That, despite contradiction with the foregoing, special tools should be used where they save operations and handling in the processing of mass quantities. 3. That the choice between standard and special tools is largely determined by the quantity to be produced and the demanded output per diem. Naturally, there are exceptions to rules.

While simple and standard tooling is to be recommended where it serves the purpose, one should nevertheless be keenly alert to the possibilities of specials "that combine the operations of several machines or tools into the one unit, and which also reduce handling to a point where one operator can do the work of several and much easier besides. Without these specials, automobiles and many household appliances—to cite specific examples—would be entirely out of reach of the mass consumer market.

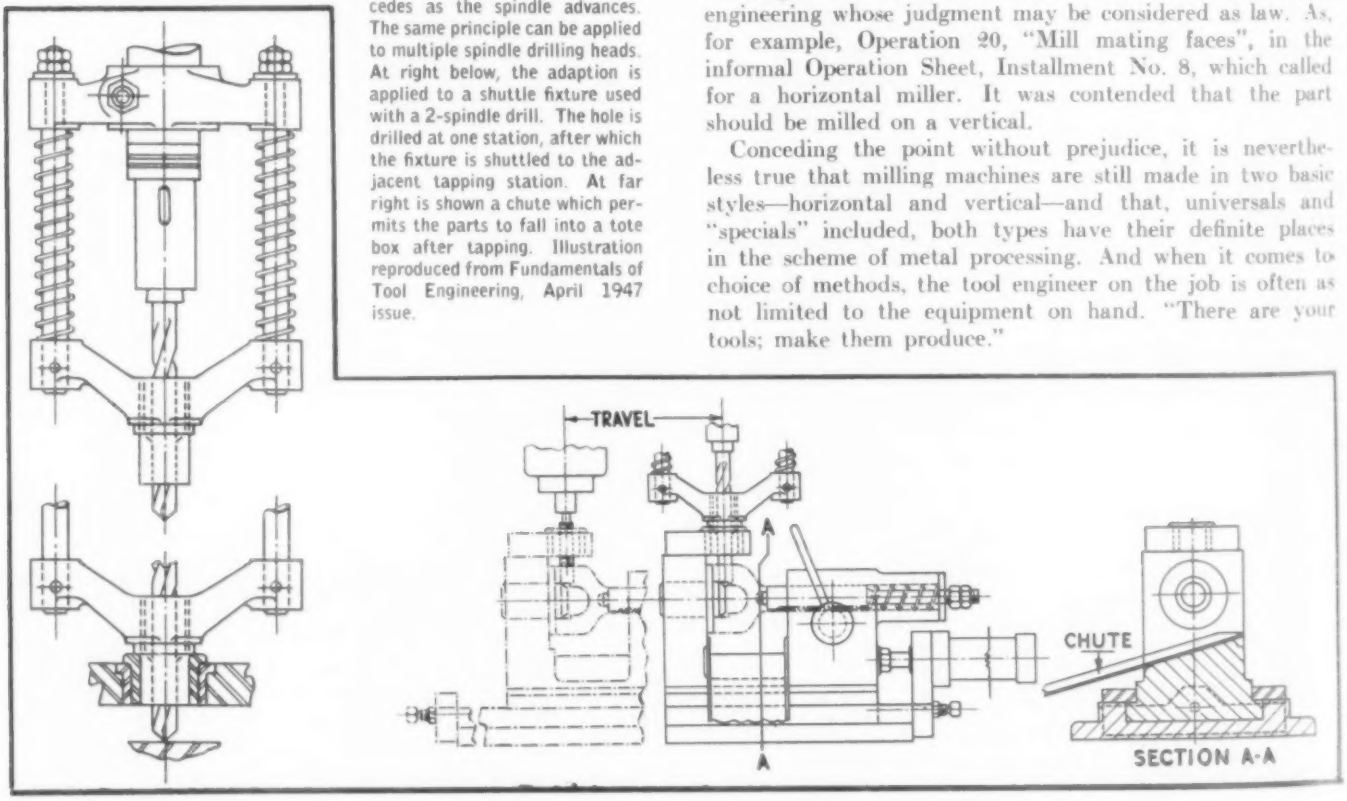
In this connection, it should be brought out that the essential function of the tool engineer is to process materials at the lowest possible cost per unit consistent with quality. And as the tool engineer is innately and necessarily creative, he sometimes succumbs to the temptation of "designing" for mass production when, actually, the tooling should be slanted for small-lot runs. And original economy, in the latter category, may be even more important than for mass production where redesign or re-working of tools can be absorbed over a period of time.

In this series, we have stressed the simpler methods, inasmuch as these are the bases for more involved procedures. We have not tried to "cover the waterfront" since, in many instances, the same issue has carried what may be termed "professional" approaches to closely similar problems. Rather, the intent has been to give the student material that is at once food for thought and something to be criticised and remolded for specific applications.

In some instances, statements made have been sharply challenged, and by outstanding leaders in the field of tool engineering whose judgment may be considered as law. As, for example, Operation 20, "Mill mating faces", in the informal Operation Sheet, Installment No. 8, which called for a horizontal miller. It was contended that the part should be milled on a vertical.

Conceding the point without prejudice, it is nevertheless true that milling machines are still made in two basic styles—horizontal and vertical—and that, universals and "specials" included, both types have their definite places in the scheme of metal processing. And when it comes to choice of methods, the tool engineer on the job is often as not limited to the equipment on hand. "There are your tools; make them produce."

Fig. 3. Below, a drill bushing installation used when a drilled hole is to be followed by a tapping or reaming operation. The bushing carried by the drill press quill enters a bushing in the fixture bushing plate and recedes as the spindle advances. The same principle can be applied to multiple spindle drilling heads. At right below, the adaption is applied to a shuttle fixture used with a 2-spindle drill. The hole is drilled at one station, after which the fixture is shuttled to the adjacent tapping station. At far right is shown a chute which permits the parts to fall into a tote box after tapping. Illustration reproduced from Fundamentals of Tool Engineering, April 1947 issue.



TOOL ENGINEERING DATA

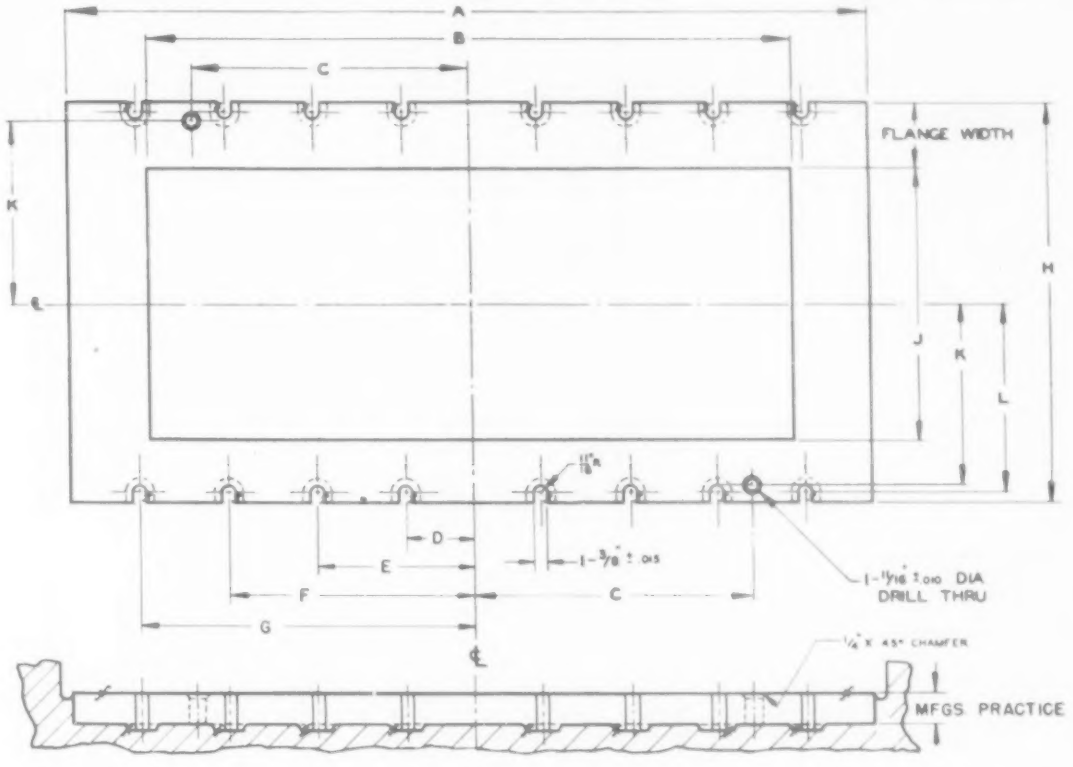
NUMBER FIVE

J. I. C. Standard Press Dimensions

Single Action—Multiple Point Press

PRESS BED

DIMENSIONS OF BED, BED OPENING, LOCATING PIN HOLES AND SPACING OF MOUNTING SLOTS



NOTE: Ribs, if added, shall be of a width and so spaced that they will not interfere with the pressure pins. Shut height shall be measured from the bed of the press with the adjustment up and stroke down.

LEFT TO RIGHT							FRONT TO BACK							
A	B	C	D	E	F	G	H	J	Width of Flange	Distance from Bed Opening to Inside of Slot	K	L	Range of Tonnages†	
± 1/4	Min.	± .015	± .032	± .032	± .032	± .032	± 1/4				± .015	± .032	Min.	Max.
48	33	9	15	—	—	—	30	21	4 1/2	2 5/16	12 3/4	13 1/4	50	125
							36	27	4 1/2	2 5/16	15 3/4	16 1/4	75	125
							36	21	7 1/2	5 5/16	15 3/4	16 1/4	150	200
							42	33	4 1/2	2 5/16	18 3/4	19 1/4	100	125
							42	27	7 1/2	5 5/16	18 3/4	19 1/4	150	250
							48	33	7 1/2	5 5/16	21 3/4	22 1/4	150	250
60	45	15	21	—	—	—	30	21	4 1/2	2 5/16	12 3/4	13 1/4	50	125
							36	27	4 1/2	2 5/16	15 3/4	16 1/4	75	125
							36	21	7 1/2	5 5/16	15 3/4	16 1/4	150	200
							42	33	4 1/2	2 5/16	18 3/4	19 1/4	100	125
							42	27	7 1/2	5 5/16	18 3/4	19 1/4	150	250
							48	33	7 1/2	5 5/16	21 3/4	22 1/4	150	300
							54	39	7 1/2	5 5/16	24 3/4	25 1/4	200	300
							60	45	7 1/2	5 5/16	27 3/4	28 1/4	250	300
72	57	21	9	27	—	—	36	21	7 1/2	5 5/16	15 3/4	16 1/4	75	200
							42	27	7 1/2	5 5/16	18 3/4	19 1/4	100	250
							48	33	7 1/2	5 5/16	21 3/4	22 1/4	150	300
							54	39	7 1/2	5 5/16	24 3/4	25 1/4	200	300
							54	33	10 1/2	8 5/16	24 3/4	25 1/4	400	500
							60	45	7 1/2	5 5/16	27 3/4	28 1/4	250	300
							60	39	10 1/2	8 5/16	27 3/4	28 1/4	400	500
84	69	27	9	33	—	—	36	21	7 1/2	5 5/16	15 3/4	16 1/4	75	200
							42	27	7 1/2	5 5/16	18 3/4	19 1/4	100	250
							48	33	7 1/2	5 5/16	21 3/4	22 1/4	150	300
							54	39	7 1/2	5 5/16	24 3/4	25 1/4	200	300
							54	33	10 1/2	8 5/16	24 3/4	25 1/4	400	500
							60	45	7 1/2	5 5/16	27 3/4	28 1/4	250	300
							60	39	10 1/2	8 5/16	27 3/4	28 1/4	400	600
							66	51	7 1/2	5 5/16	30 3/4	31 1/4	250	300
							66	45	10 1/2	8 5/16	30 3/4	31 1/4	400	600
							72	51	10 1/2	8 5/16	33 3/4	34 1/4	400	600

† See Increments Next Page.

J. I. C. Standard Press Dimensions

Single Action—Multiple Point Press

PRESS BED

DIMENSIONS OF BED, BED OPENING, LOCATING PIN HOLES AND SPACING OF MOUNTING SLOTS

LEFT TO RIGHT							FRONT TO BACK							
A	B	C	D	E	F	G	H	J	Width of Flange	Distance from Bed Opening to Inside of Slot	K	L	Range of Tonnages†	
±1/4	Min.	±.015	±.032	±.032	±.032	±.032	±1/4				±.015	±.032	Min.	Max.
96	81	33	9	39	—	—	48	33	7 1/2	5 9/16	21 3/4	22 3/4	150	300
							54	39	7 1/2	5 9/16	24 3/4	25 3/4	200	300
							54	33	10 1/2	8 9/16	24 3/4	25 3/4	400	500
							60	45	7 1/2	5 9/16	27 3/4	28 3/4	250	300
							60	39	10 1/2	8 9/16	27 3/4	28 3/4	400	800
							66	51	7 1/2	5 9/16	30 3/4	31 3/4	250	300
							66	45	10 1/2	8 9/16	30 3/4	31 3/4	400	800
							72	51	10 1/2	8 9/16	33 3/4	34 3/4	400	800
108	93	39	9	45	—	—	48	33	7 1/2	5 9/16	21 3/4	22 3/4	150	300
							54	39	7 1/2	5 9/16	24 3/4	25 3/4	200	300
							54	33	10 1/2	8 9/16	24 3/4	25 3/4	400	500
							60	45	7 1/2	5 9/16	27 3/4	28 3/4	250	300
							60	39	10 1/2	8 9/16	27 3/4	28 3/4	400	800
							66	51	7 1/2	5 9/16	30 3/4	31 3/4	250	300
							66	45	10 1/2	8 9/16	30 3/4	31 3/4	400	800
							72	51	10 1/2	8 9/16	33 3/4	34 3/4	400	1250
							78	57	10 1/2	8 9/16	36 3/4	37 3/4	400	1250
							84	63	10 1/2	8 9/16	39 3/4	40 3/4	500	1250
120	105	45	9	27	51	—	60	45	7 1/2	5 9/16	27 3/4	28 3/4	250	300
							60	39	10 1/2	8 9/16	27 3/4	28 3/4	400	800
							66	51	7 1/2	5 9/16	30 3/4	31 3/4	250	300
							66	45	10 1/2	8 9/16	30 3/4	31 3/4	400	800
							72	51	10 1/2	8 9/16	33 3/4	34 3/4	400	1250
							78	57	10 1/2	8 9/16	36 3/4	37 3/4	400	1250
							84	63	10 1/2	8 9/16	39 3/4	40 3/4	500	1250
132	117	51	9	33	57	—	60	45	7 1/2	5 9/16	27 3/4	28 3/4	250	300
							60	39	10 1/2	8 9/16	27 3/4	28 3/4	400	800
							66	51	7 1/2	5 9/16	30 3/4	31 3/4	250	300
							66	45	10 1/2	8 9/16	30 3/4	31 3/4	400	800
							72	51	10 1/2	8 9/16	33 3/4	34 3/4	400	1250
							78	57	10 1/2	8 9/16	36 3/4	37 3/4	400	1250
							84	63	10 1/2	8 9/16	39 3/4	40 3/4	500	1250
							90	69	10 1/2	8 9/16	42 3/4	43 3/4	500	1250
							96	75	10 1/2	8 9/16	45 3/4	46 3/4	500	1250
144	129	57	9	33	63	—	72	51	10 1/2	8 9/16	33 3/4	34 3/4	400	1250
							78	57	10 1/2	8 9/16	36 3/4	37 3/4	400	1250
							84	63	10 1/2	8 9/16	39 3/4	40 3/4	500	1250
							90	69	10 1/2	8 9/16	42 3/4	43 3/4	500	1250
							90	63	13 1/2	11 9/16	42 3/4	43 3/4	1600	2000
							96	75	10 1/2	8 9/16	45 3/4	46 3/4	500	1250
							96	69	13 1/2	11 9/16	45 3/4	46 3/4	1600	2000
156	141	63	9	39	69	—	72	51	10 1/2	8 9/16	33 3/4	34 3/4	400	1250
							78	57	10 1/2	8 9/16	36 3/4	37 3/4	400	1250
							84	63	10 1/2	8 9/16	39 3/4	40 3/4	500	1250
							90	69	10 1/2	8 9/16	42 3/4	43 3/4	500	1250
							90	63	13 1/2	11 9/16	42 3/4	43 3/4	1600	2000
							96	75	10 1/2	8 9/16	45 3/4	46 3/4	500	1250
							96	69	13 1/2	11 9/16	45 3/4	46 3/4	1600	2000
							102	81	10 1/2	8 9/16	48 3/4	49 3/4	500	1250
							102	75	13 1/2	11 9/16	48 3/4	49 3/4	1600	2000
							108	87	10 1/2	8 9/16	51 3/4	52 3/4	500	1250
							108	81	13 1/2	11 9/16	51 3/4	52 3/4	1600	2000
180	165	75	9	33	57	81	84	63	10 1/2	8 9/16	39 3/4	40 3/4	500	1250
							90	69	10 1/2	8 9/16	42 3/4	43 3/4	500	1250
							90	63	13 1/2	11 9/16	42 3/4	43 3/4	1600	2000
							96	75	10 1/2	8 9/16	45 3/4	46 3/4	500	1250
							96	69	13 1/2	11 9/16	45 3/4	46 3/4	1600	2000
							102	81	10 1/2	8 9/16	48 3/4	49 3/4	500	1250
							102	75	13 1/2	11 9/16	48 3/4	49 3/4	1600	2000
							108	87	10 1/2	8 9/16	51 3/4	52 3/4	500	1250
							108	81	13 1/2	11 9/16	51 3/4	52 3/4	1600	2000
204	189	87	9	33	63	93	96	75	10 1/2	8 9/16	45 3/4	46 3/4	500	1250
							96	69	13 1/2	11 9/16	45 3/4	46 3/4	1600	2000
							102	81	10 1/2	8 9/16	48 3/4	49 3/4	500	1250
							102	75	13 1/2	11 9/16	48 3/4	49 3/4	1600	2000
							108	87	10 1/2	8 9/16	51 3/4	52 3/4	500	1250
							108	81	13 1/2	11 9/16	51 3/4	52 3/4	1600	2000
228	213	99	9	45	75	105	96	75	10 1/2	8 9/16	45 3/4	46 3/4	1000	1250
							96	69	13 1/2	11 9/16	45 3/4	46 3/4	1600	2000
							102	81	10 1/2	8 9/16	48 3/4	49 3/4	1000	1250
							102	75	13 1/2	11 9/16	48 3/4	49 3/4	1600	2000
							108	87	10 1/2	8 9/16	51 3/4	52 3/4	1000	1250
							108	81	13 1/2	11 9/16	51 3/4	52 3/4	1600	2000

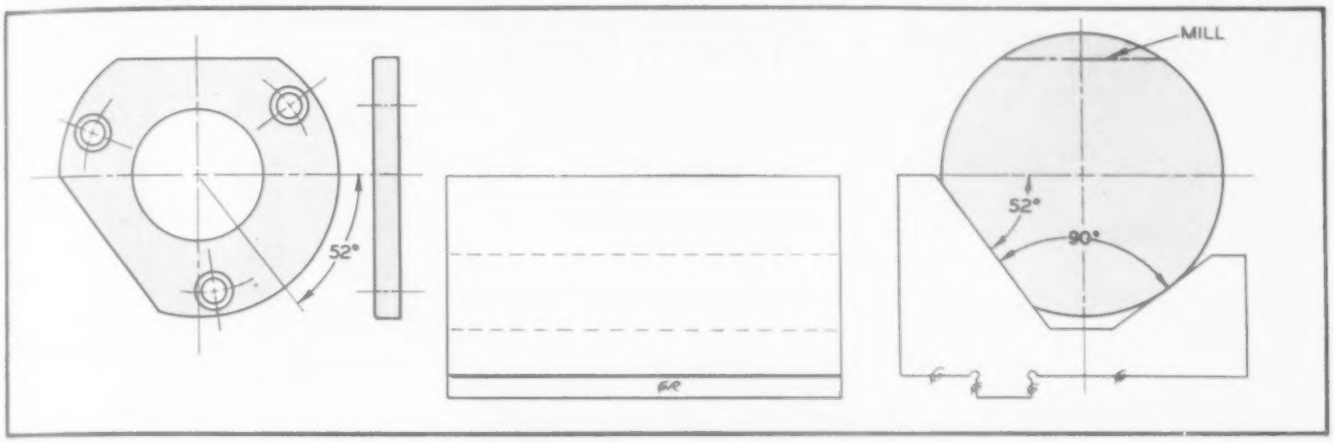
†INCREMENTS — TONS

From 50 Tons to 150 Tons, Incl. : INCREMENT = 25 Tons
Above 150 Tons to 300 Tons, Incl. : INCREMENT = 50 Tons
Above 300 Tons to 600 Tons, Incl. : INCREMENT = 100 Tons
Above 600 Tons to 1000 Tons, Incl. : INCREMENT = 200 Tons
Above 1000 Tons to 1250 Tons, Incl. : INCREMENT = 250 Tons
Above 1250 Tons to 1600 Tons, Incl. : INCREMENT = 350 Tons
Above 1600 Tons to 2000 Tons, Incl. : INCREMENT = 400 Tons

The above suggested standards have been adopted by the Joint Industry Conference, a group comprising representatives of press manufacturers and users, in the interests of dimensional standardization and more effective press usage.

GADGETS

Method for Angular Milling



A simple V-block insures accurate duplication in small-lot milling of parts.

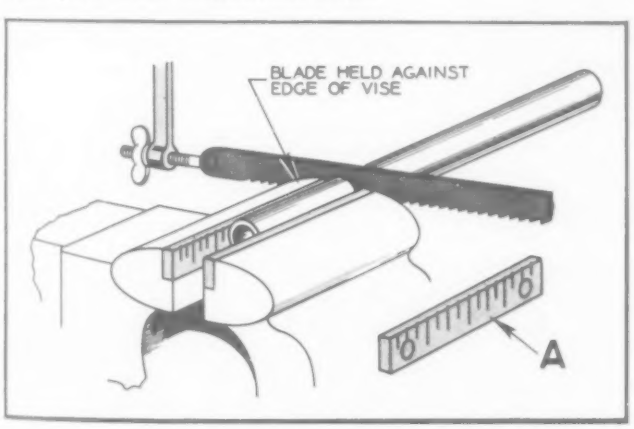
When only small lots of a detail are to be machined, the usual practice is to perform the operation by the layout method. Yet, where accuracy and duplication are requisites, it may be wise to use a special tool if such can be economically constructed. For example, the part shown requires two flat surfaces to be milled at a 52 deg angle, which must be accurate. After reaming the hole, turning the O.D. and facing to thickness, as a previous operation, one flat is milled by holding the parts in a milling vise.

The opposite flat is milled by holding a number of the parts in a V-block, in which the previously milled flat is located against the 52 deg side. The opposite flat is then milled, the parts being clamped in a vise, as before, with the V-block serving as an angular locator. To insure squareness, the V-block is located in the vise by means of the tongue nesting in one of the vise slots.

Robert Mawson,
Providence, R. I.

The Tool Engineer pays regular page rates for accepted contributions to these pages, with a minimum of $5.00 for each item.

Vise Jaw with Graduated Scale



A scale on the jaws of a bench vise provides for easy duplication when cutting off bar stock.

Cutting a number of pieces of tubing of equal length in a vise recently required separate measurement for each piece. It became obvious that a scale or graduation on one of the vise jaws would facilitate measurement, so on the inside face of one of the jaws, a scale was inscribed as at *A*. The jaw first was annealed, the graduation then cut by a knife-edge file, after which the jaw was rehardened, polished and reassembled. A combination square with adjustable scale was used to obtain correct spacing for the graduations, which slightly overlap the top face of the jaw for easy reading. In cutting a section from a tube, bar or rod, the end is placed in the vise to coincide with the length required, and then clamped. The back-saw blade then is set against the edge of the vise which in turn acts as a guide while sawing. The graduations could be cut on the top face of the jaw if preferred.

C. W. Frank, Springfield, Mass.

To Preserve Layout Lines

It often happens that one must shape or mill parts, such as dies, punches or form tools, working from the layout lines only. If the part is machined in the usual way—that is, with the layout lines ahead of the cut—the lines will be destroyed as a result of stock breaking away.

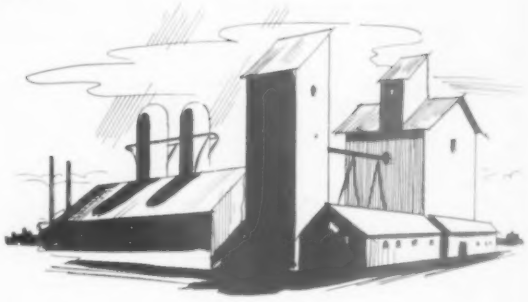
If however, the scribed lines are toward the cut, then the outline will remain sharply delineated during the entire shaping operation. The shaping will be considerably facilitated if a templet is clamped against the workpiece. One then has a clearly visible guard against cutting below the lines during the roughing cuts.

A note can be added here. In laying out work, it is customary to coat it with copper sulphate and then to scribe the lines. This method is okay if lighting conditions are good. But where light is poor, a coating of chalk over the coppered surface will make the lines stand out clearly.

Federico Strasser, Santiago de Chile

Industry Takes Its Production Problems To A.S.T.E. Convention

Pittsburgh Meeting Accents Technical Phases, House of Delegates Makes Requests to Board



By Doris B. Pratt

INDUSTRIES AS vital and varied as atomic energy projects, aircraft development, shipbuilding, railroad and oil field equipment may benefit from the ASTE 17th annual meeting at Pittsburgh, March 10-12.

Representatives from these and from manufacturers of innumerable industrial and consumer products were among the 515 production men who registered at Hotel William Penn for the technical sessions, plant tours and other events that filled a three-day program.

This return visit to the city that first hosted the Society in 1938 had the earmarks of an old home week celebration. It reunited members long absent from national meetings. It brought together ASTE'ers from points as distant and unlike as Albuquerque, N. M., Bombay, India, and Biddeford, Me. From the first plant tour right through the concluding banquet, addressed by L. E. Osborne, Westinghouse vice-president, there was an atmosphere of friendship and sociability.

Emphasis was on the technical side with a wide choice of concurrent sessions and plant tours.

Thursday noon and Friday morning buses left at short intervals for local metal working plants. Operations shown on several of these trips coincided with lectures presented at the technical sessions.

Production of tungsten carbide parts was demonstrated at Firth-Sterling Steel & Carbide Corp. Starting in the powder stock room, the visitors saw the mixing of metal powders, carburizing, reduction, and paraffining.

In the pressing room, the lubricated powders were compacted into tool tips, die blanks or billets. Next came half-sintering in furnaces, to eliminate the paraffin, followed by final sintering, finishing and inspection.

At the New Kensington Works of Aluminum Company of America, R. L. Templin, chief engineer of tests and assistant director of research, discussed an experimental high-speed lathe, developed with the aid of machine tool and bearing

Above: President Douglas smiles proudly at president emblem being pinned on by his predecessor, I. F. Holland. Mr. Douglas is first president to receive new insignia. Below: Directors and committee chairmen recess board meeting for luncheon. From left: around table: T. J. Donovan, Jr., director; Mr. Douglas, A. M. Sargent, building chairman; R. R. Linch, constitution and by-laws chairman; H. B. Osborn, Jr., public relations chairman; W. A. Dawson, professional engineering chairman; J. J. Demuth and K. L. Bues, directors; R. H. Morris, building finance chairman; C. V. Briner, past president; L. B. Bellamy, standards chairman; H. L. Tigges, vice-president; R. W. Ford, director; H. E. Conrad, executive secretary; E. W. Baumgardner, program; H. F. Owen, education chairman; W. B. Peirce, director; I. F. Holland, chairman of board; W. B. McClellan, national secretary; G. A. Goodwin, national treasurer; V. H. Ericson, vice-president; J. S. Eacock, ASTE office manager; H. J. Richards, H. E. Collins, directors

manufacturers, then showed a film of the lathe in operation.

Moving to the central machine shop, the party observed the actual machine turning aluminum alloy at high speeds. Cutting speeds as high as 20,000 fpm have been attained, the visitors learned. After the demonstration the engineers studied a wide range of manufacturing operations in the machine shop.

Tool engineers who tackled the 200-acre marathon through the Westinghouse Electric Corp. East Pittsburgh Works were rewarded by seeing the handling, forming and processing of metal on a gigantic scale for power plant, transportation and industrial equipment.

Other trips were made to Westinghouse Air Brake Co., the Etna pipe mills of National Supply Co., Irvin Works of Carnegie-Illinois Steel Corp., Gulf Research & Development Co. Laboratories, Bronze Div. of James H. Matthews & Co., and the Westinghouse gearing plant.

Predicts Self-Heating Auto Windows

Your next automobile may have windows of a self-heating glass that conducts electric current, according to R. A. Miller, technical sales engineer, product development department, Glass Div. of Pittsburgh Plate Glass Co., who reported "Modern Glass Developments," in one of the Thursday evening technical sessions. Mr. Miller described other new types of glass and compared glass and metal processing.

Possibilities of "Color as a Tool" were projected by N. A. Mason, manager, maintenance-painter sales, Paint Div., Pittsburgh Plate Glass Co. With charts he showed examples of color combinations for factory buildings and equipment, aimed at increasing the efficiency of the worker.

Lecturing on "Design of Dies for Upsetting Forging Machines," W. W. Criley, vice-president and general manager, The Ajax Mfg. Co., pointed out that these machines are not limited to gripping and heading. The moving die may also be used for shearing, swaging, bending, flattening and punching.

Friday evening was devoted to "Processing Corrosion-Resistant Steel." Dr. George A. Roberts, chief metallurgist, Vanadium-Alloys Steel Co., listed "Materials Used in Forming Corrosion-Resistant Steel." Strength of press and wall thickness of die should be at least 50 percent greater for stainless steels than for low carbon material, he cautioned.

M. F. Judkins, chief engineer, Carbide Div., Firth-Sterling Steel & Carbide Corp., continued the symposium with a discussion of "Techniques for Machining Corrosion-Resistant Steel."

Techniques for machining stainless steel he classified as: (1) preventive measures to avoid harmful effects of work

Top: L. E. Osborne, Westinghouse vice-president, tells banquet audience tax reduction would stimulate business and boost national income. Center, upper: W. A. Dawson, chairman of committee on professional engineering, explains plans for advancing professional status of membership. From left: Norman Smith of South Bend, H. O. Poock, Dayton; Mr. Dawson, George Tillotson, Dayton; L. G. Singer, Toronto member of committee; H. C. McMillen, Evansville. Lower: Registration gets under way before official opening hour of convention. Bottom: President Douglas installs new Pittsburgh officers during banquet. Officers, from left: Frank Boyd, chairman; G. C. Wood, first vice-chairman; H. L. Harper, second vice-chairman; Fred Hammer, secretary and W. J. Bickmore, treasurer of the host group for annual meeting

Left: At National Supply Co. Etna pipe mill, this ASTE group watches hot saw cut through pipe in 1/25 of a second. Party includes Sven Hansen, of Mt. Vernon, Ohio; W. R. Gordon and E. W. Pike, of Rochester; R. G. Coleman of Toronto; and George Smith, company guide. Right: Production of sintered carbide parts at Firth-Sterling Steel & Carbide plant fascinates these engineers. From left: S. F. Steiner of Springfield, Ohio; F. A. Zander and C. G. Hillegonds of Ann Arbor, Mich.; Bernard Weckelman and Charles Yackiw of Rochester; G. A. Rogers of Montreal; D. A. Olson of Toronto; J. W. Richard of Pittsburgh; and W. G. Ehrhardt (in front of operator) of St. Louis

hardening, and (2) corrective measures to cure trouble after it has developed.

Two speakers from Aluminum Company of America lectured Saturday morning on "Fabricating Aluminum." E. G. Kort of the Jobbing Div., discussed "Drawing and Spinning Aluminum and Its Alloys." He explained operations similar to those described in a series of articles running in *The Tool Engineer*.

Thermal dimension changes and differential of expansion between large aluminum work pieces and the steel jigs used highlighted a talk on "Efficient Machining of Aluminum Alloys" by E. S. Howarth, chief, Metal Working Div., Alcoa Research Laboratories.

Metal spraying, a rather difficult subject, was well handled by W. B. Meyer, secretary, American Metallizing Contractors Assn., and manager, Metallizing Div., John Nooter Boiler Works Co.

A sprayed metal part, he stated, will usually outwear by many times its seemingly harder counterpart made of solid metal of the same analysis.

Speakers' Papers Available

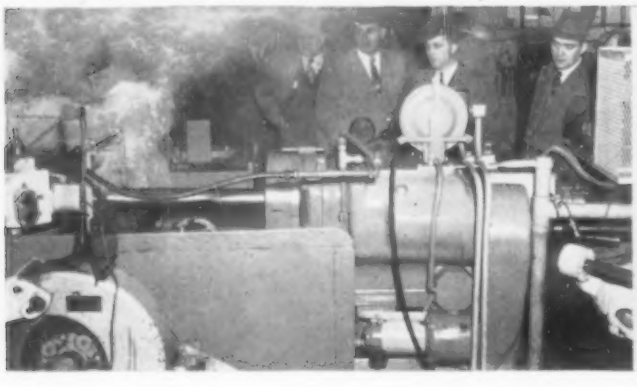
Copies of the speakers' papers are available upon request from the Society.

Chairmen for the technical sessions were: W. W. Walter, sales engineer, Barney Machinery Co.; A. G. Crowell, tool engineer, Kerotest Mfg. Co.; J. W. Richards, industrial designer, Koppers Co.; F. F. Versaw, shop superintendent, Gulf Research & Development Co. Laboratories; R. C. Niemeier, president, Barney Machinery Co.; and Gardner Young, tool supervisor, Westinghouse Electric Corp., all of Pittsburgh.

* * *

While the engineering program was under way, administrative groups and national committees were holding their annual business meetings.

Center, upper: Members signing up for plant tours have difficulty making selections from many attractive trips offered. Lower: High spot in the Aluminum Company of America visit was this experimental high speed lathe demonstrated at surface speeds up to 10,500 fpm, removing 448 cu. in. of aluminum alloy in the same unit of time. Bottom left: Observing cutting oil test on turret lathe at Gulf Research & Development Co. Laboratories are: T. G. Robbins, J. Milne and J. J. Darron, Detroit; P. H. Sweet, Indianapolis, and G. W. Gleim, New York. Right: Westinghouse Electric Corp. East Pittsburgh Works is destination of this busload of tool engineers



Left: [illegible] B. Meyer of the American Metallizing Contractors A[illegible], shows sample of metallizing during lecture on this subject. R. C. Niemeier, beside him, was chairman of session. Right: G. A. Roberts of Vanadium-Alloys Steel Co. and M. F. Judkins of Firth-Sterling Steel & Carbide Corp. receive certificates of appreciation from J. H. Thomas who presided during their talks on processing corrosion-resistant steel

Following a caucus Thursday, the house of delegates met formally the next morning to elect national directors. I. F. Holland, retiring president, opened the meeting, swore in the authorized delegates and alternates, outlined their responsibilities, and conducted an election for chairman, won by Andrew Carnegie of Detroit.

With Mr. Carnegie presiding the delegates elected as Credentials Committee: T. E. Newby of Western Michigan chapter, chairman; P. A. Patterson, Philadelphia; and B. J. Hazewinkel, Denver.

Waindle Named Recorder

R. F. Waindle of Fox River Valley was chosen recorder. Tellers to count directoral votes were: F. J. Dawless of New Haven, chairman; Fred Crook, Toronto; and Karl Kaiser, Rockford.

Ten directors were voted in for one year, beginning with the October semi-annual meeting, as reported in the April *ASTE News*.

H. E. Conrad of Detroit, executive secretary, and R. R. Linch, Los Angeles, national constitution and by-laws chairman, were called into the meeting to enlighten the house on subjects under discussion and to advise on legal technicalities.

Among resolutions adopted by the house for recommendation to the board of directors were requests for: revision in design of the past chairman pin; substitution of regional meetings for semi-annuals, when and if fall conventions are discontinued, with consequent transfer of funds to the area meeting project; establishment of a certificate of merit award for work of outstanding chapters or members in advancing the aims of the Society.

Also recommended were: provision for members studying full time at recognized educational institutions to continue at student dues rates until completion of their course; and more space for *ASTE News* in *The Tool Engineer*.

After opening the house of delegates meeting, President Holland entered the adjoining room to take the gavel for the last time as chairman of the board.

Answering roll call by National Secretary W. B. McClellan of Detroit were: R. B. Douglas of Montreal, first vice-president; H. L. Tigges, Toledo, second vice-president; K. L. Bues, Golden Gate; H. E. Collins, Houston; J. J. Demuth, St. Louis; T. J. Donovan, Jr., Philadelphia; R. W. Ford and W. B. Peirce, Pittsburgh; and H. J. Richards, Boston, all directors; V. H. Ericson, third vice-president, G. A. Goodwin, national treasurer, and Mr. Conrad. Director G. S. Wilcox, Jr., of Detroit was unavoidably detained by business.

Reading from his annual report in

Upper left: Caught unawares, the Host Chapter Committee irons out final details on eve of convention. From head of table clockwise: F. J. Schmitt and Gardner Young of National Program Committee, F. W. Hammer, A. G. Crowell, J. W. Richard, W. B. Peirce, F. P. Tirk, J. P. Wiley, J. M. Lloyd, H. G. Eisele, W. S. Risser, W. H. Schott, G. C. Wood, W. A. Potter, J. N. Thomas, D. L. Bardes, Ralph Esposito, W. W. Walter, H. J. Bickmore, and H. M. Windsor of Detroit office. Right: Throughout convention technical sessions drew attentive audiences. Lower left: Speakers for the opening session have dinner with Society officials. From left around table: A. G. Crowell, J. W. Richard and W. W. Walter, session chairmen, W. W. Criley of Ajax Mfg. Co., N. A. Mason and R. A. Miller of Pittsburgh Plate Glass Co., I. F. Holland, president; H. E. Conrad, executive secretary, and E. W. Baumgardner, national program chairman. Right: E. G. Kort shows Gardner Young (right) and E. S. Howarth cutaway samples of successive aluminum drawings for beer barrels. Mr. Kort and Mr. Howarth, both of Aluminum Company of America, discussed fabricating of aluminum at session which Mr. Young chairmanned

corporating a resume of committee reports and approved recommendations, Mr. Holland announced that former and prospective exhibitors had been notified of the 1950 Tool Engineers Industrial Exposition to be held in Public Auditorium, Cleveland, Ohio, March 20-24. Complete information and floor plans will be released October 1, he added.

Building Finance Chairman Ray H. Morris of Hartford was quoted as reporting subscriptions of $53,800 in building fund participation certificates, as of March 7 (total at press time is $63,000). The committee hopes to complete the $110,000 issue towards financing the new Detroit headquarters building by September 1, when the state permit to offer securities expires.

With the structure free and clear, there is a balance of $5634.48 remaining in the $160,000 appropriation for erecting Society office quarters. For his efforts in this undertaking, the directors voted A. M. Sargent, building chairman, a certificate of appreciation to be presented at the semi-annual meeting in October.

Problems concerning committee organization and functions were reported by D. R. Linch, constitution and by-laws chairman, to be contingent on findings of a special committee. Appointed by Mr. Holland, the committee consists of Mr. Linch, chairman; H. F. Owen, Indianapolis; L. B. Bellamy, Detroit; E. W. Baumgardner, Cleveland; and R. H. Morris, Hartford.

Although operating on a somewhat reduced scale, the Public Relations Committee has kept the press informed of Society activities, according to H. B. Osborn, Jr., chairman. Its program is being stepped up to promote the 1950 Cleveland tool show, he stated.

In his account of national headquarters staff operations, Mr. Conrad commented on the approval of members who have visited the new office facilities.

Twice since the semi-annual meeting at Los Angeles, the national officers have met to consider specific actions requiring immediate decision and to proceed as instructed at the California meeting. Their recommendations, Secretary McClellan indicated in his report, would be presented to the board.

Should Aim for Greater Dues Income

Economy and extreme prudence in financial commitments keynoted the report of G. A. Goodwin, national treasurer. If membership reaches the 25,000 goal, he estimates, dues would cover normal expenses without adding any appreciable overhead and without drawing upon other income.

J. A. Siegel, chairman of the joint Judicial-Honor Awards Committee, received board approval of an awards plan for papers presented at chapter meetings and published in *The Tool Engineer*, as requested by the Editorial Committee. Such awards are to be made from *Tool Engineer* funds, the directors authorized. Details are to be worked out by Mr. Siegel's committee.

Top: More efficient chapter operation is aim of this group attending chapter officers school. Below: Largest attendance of past presidents gathered at one time turns out to honor President Holland at luncheon. From left: J. R. Weaver, W. F. Wagner, A. M. Sargent, F. A. Shuler, D. D. Burnside, A. H. d'Arcambal (presenting past president pin), R. H. Morris, Mr. Holland, C. V. Briner, W. B. Peirce, R. M. Lippard; (seated): T. B. Carpenter, J. A. Siegel and W. H. Smila. Center, from left: W. B. Peirce, reception chairman, greets C. B. Gundu Rao, ASTE'er from Bombay, India, and his friend Chandra Prakash, textile engineer. Dick Linch's king-size, custom-made stogie and corduroy sports jacket lend Hollywood touch to convention. Ray Morris (extreme right) wishes T. J. Donovan, Jr., a happy birthday. Other well wishers are C. V. Briner and V. H. Ericson. Bottom: Official chapter representatives assemble in house of delegates to elect board of directors for coming year

During a closed session the board discussed plans for assuming publication of the Society magazine and elected national officers (reported in the April issue).

Under the direction of W. A. Dawson of Hamilton, the Committee on Professional Engineering has distributed 500 copies of the booklet, "Professional Registration Laws and the Engineer," to all elected officers of each chapter. Information on presenting refresher courses, preliminary to examination for state registration, will be released to chapters.

Other committee activities and board actions were reported in the March and April issues. *(More next page).*

Top: Gardner Young (right), ferocious barker of the "Hounds," exclusive ASTE social fraternity, lines up his candidates for initiation. Chester Fischer of Pittsburgh looks with trepidation at William Penn lobby through which he must drag "Snoopy," the vocal club mascot. Other initiates are from left: C. H. Peters of Louisville, J. H. Thomas, G. C. Wood and H. L. Harper of Pittsburgh and John Black of Louisville. Below, left and right: H. F. Owen, 1948 education chairman, checks with his committee on work progress. From left: S. B. Hagberg, P. A. Smith, Mr. Owen, J. N. Edmondson and C. D. Wright. E. W. Ernst, handbook chairman, looks at galleys with F. W. Wilson, editor. Committeemen, from left: Frank Martindell, Mr. Wilson, A. L. Potter (standing), Mr. Ernst, Harry Grump, F. W. Curtis and B. C. Brosheer (front). Part of the Detroit delegation gets together at banquet. From left: O. E. Harvey, G. S. Wilcox, Jr., L. B. Bellamy, M. O. Cox, W. B. McClellan, L. G. Briggs and A. M. Sargent. Canadians fete R. B. Douglas, new president, and I. F. Holland, retiring ASTE head, (end of table) at breakfast. Bottom. ASTE ladies visit H. J. Heinz Co. plant to learn techniques of mass production cooks

National committee chairmen attending the board meeting also included: H. F. Owen of Indianapolis, education; E. W. Ernst, Schenectady, handbook; E. W. Baumgardner, Cleveland, program; L. B. Bellamy, Detroit, standards; and F. W. Curtis, Springfield (Mass.), editorial. G. C. Johnson of Rockford, finance chairman, was absent and F. J. Dawless, membership chairman, was representing his chapter in the house of delegates.

The newly elected national officers, and the Handbook, Professional Engineering, Education, Program, and Honor Awards-Judicial committees shaped up their programs for the new year during organization meetings of their respective groups.

Record Turnout of Presidents

Probably the largest group of past presidents ever attending a national ASTE meeting gathered for luncheon Saturday noon. I. F. Holland, retiring president, was added to the ranks when A. H. d'Arcambal of Hartford presented a past president pin in the presence of 12 other predecessors in office.

That morning some 20 Canadians breakfasted together to honor their countryman, R. B. Douglas, elected president the previous day. Mr. Holland also was a guest at this function.

Many of the registrants got their first good look at Pittsburgh when they took off in the afternoon for the Buhl Planetarium. Outside the sun had pierced leaden skies after two dull, sodden days. But in the "theater of the stars," darkness obliterated the heavens during man-made previews of the April 12 lunar eclipse and of a total solar blackout.

More Marvels of Science

Of even greater interest to those who had already seen a planetarium show was the General Electric "House of Magic" demonstration. By verbal commands a company engineer made a toy electric train stop, back up and proceed. He shook hands with his shadow, lighted an electric lamp with a match, played tunes by interrupting a light beam, exploded a paper wheel, made a whirling gear appear to stand still under stroboscopic light, and performed other seemingly magical feats.

After these shows some of the group lingered to stroll about the building, study scientific exhibits and watch other demonstrations by planetarium aides.

About 25 chapter executives stayed behind at convention headquarters to attend a chapter officers school conducted by Mr. Holland. They listened alertly while he detailed various phases of chapter operation and as Director J. J. Demuth, former constitution and by-laws chairman, explained an organization chart concerning committee setup. Both instructors answered numerous questions from the audience.

By evening nearly everyone was on hand for the banquet in the Penn ballroom, where L. E. Osborne, senior operating vice-president of Westinghouse Electric Corp., Pittsburgh addressed the Society. His subject was "Tools—Key to Abundance."

Making a strong plea for tax reduction or assurance of no increase, Mr. Osborne asserted that industry will continue to plow back profits into new facilities, if Congress does not burden manufacturers and workers with higher taxes.

"When profits are good," he said, "business will install tools. When the market weakens, business makes its old tools do."

In 1948, he added, American corporations made 20 billion dollars after taxes and reinvested more than 22 billions in capital assets.

Although 85 percent of our work is now done with mechanical energy, Mr. Osborne feels that still more can be accomplished better and cheaper with new equipment already on the market.

More Production—More Pay

But there are strong, subtle forces that tend to stem our progress, he warned. Too many people have the idea that you can have more without producing more.

Over the years, he reminded, the American people have secured lasting benefits only by producing more goods. Since 1900, money wages have multiplied six times, cost of living has increased three times, so that real purchasing power has doubled. This has happened only through a comparable increase in production.

This added productivity has not come out of the hide of the worker, Mr. Osborne pointed out, but from the mechanization of all industry and from improved processes. Steady technological advancement has raised the American standard of living.

Wants Compel Progress

"I hope that the American people never stop wanting more. This is imperative to the driving force of our progress. If that force dies out, our nation will die with it," he concluded.

Mr. Osborne's address climaxed an impressive installation program. After dinner Executive Secretary Conrad introduced speakers' table guests. Mr. Holland made his annual report to the membership, in which he paid tribute to the vision of the Society founders, thanked his fellow officers, and wished his successor good luck.

Top, left: After taking office as president, R. B. Douglas (left) receives brief case from W. A. Dawson with good wishes of Canadian membership. Right: V. H. Ericson (left) makes presentation of camera, gift of officers and directors to President Holland on his retirement. Below, Left: W. S. Risser, retiring chairman of Pittsburgh chapter, is pleased with watch presented by W. S. Schott, another former chairman, as gift of chapter. Right, Enjoying banquet reception, from left: President and Mrs. Douglas, Director R. W. Ford, National Secretary W. B. McClellan, Mrs. G. A. Goodwin and National Treasurer Goodwin, are snapped by the roving photographer

Everybody had a gala evening at the banquet which concluded the Society's successful 17th annual meeting

Performing his last official act as president, Mr. Holland installed the incoming officers: R. B. Douglas, president; H. L. Tigges, first vice-president; J. J. Demuth, second vice-president; H. F. Owen, third vice-president; W. B. McClellan, national secretary; and G. A. Goodwin, national treasurer.

An innovation was the presentation of a president pin to Mr. Douglas, first chief executive to wear this new insignia. Mr. Holland also turned over the official gavel to his successor.

Mr. Douglas reciprocated by presenting to Mr. Holland the life membership certificate the Society awards its retiring presidents.

As a token of appreciation for his leadership, the officers and directors serving with Mr. Holland gave him a camera. The gift was presented by V. H. Ericson, his third vice-president.

Canadians Gift President

Not to be outdone, the Canadian membership, represented by W. A. Dawson, presented Mr. Douglas with a brief case "to transfer the tools of office from one chapter to another and to convey the good will of Canadian ASTE'ers to our American members."

In his inaugural address President Douglas commended the achievements of preceding administrations in building the organization. Commenting on industry, he observed that American production is at the crossroads—the direction it takes will depend on the ability of management to back up the tool engineer.

Pittsburgh chapter officers for 1949-50, all active on the convention committee, took the oath of office from President Douglas. They are: Frank Boyd, chairman; G. C. Wood, first vice-chairman; H. L. Harper, second vice-chairman; Fred Hammer, secretary; and W. J. Bickmore, treasurer.

William H. Schott, a past chairman, presented a watch to Walter S. Risser, retiring chairman, on behalf of the chapter.

A floor show and dancing followed the formal program. During dinner Carl Johnson, a former Pittsburgh chapter secretary, rendered vocal solos.

* * *

The smooth operation of the convention reflected the efficient work of the host chapter committee, who handled all program and physical arrangements in cooperation with National Program Chairman E. W. Baumgardner, First Vice-Chairman F. W. Schmitt of Chicago and Gardner Young, Pittsburgh member of the Program Committee.

Headed by W. S. Risser, general chairman, the local committee included: W. H. Schott, W. W. Walter, W. B. Peirce, J. P. Wiley, William Owen, D. L. Bardes, J. H. Thomas, G. C. Wood, J. M. Lloyd, P. H. Magnus, F. W. Hammer and H. G. Eisele.

Wives of the Pittsburgh members were hostesses to the visiting ladies and accompanied them at radio broadcast parties and on a tour of the H. J. Heinz food processing plant.

Westinghouse Unit Begins Second Year in ASTE

Pittsburgh, Pa.—After a year of successful operation, the Westinghouse ASTE tool engineer apprentice graduate group is now firmly established as a unit of Pittsburgh chapter of the Society.

Organized May 5, 1948, the Westinghouse tool men meet the third Thursday of each month. Technical programs have included such subjects as: Manufacturing and Uses of Micarta, Precision Casting, Television, Problems of a Manufacturing Engineer, and Ceramics.

Through these programs the group is supplying its members with knowledge of Westinghouse apparatus and manufacturing know-how. Pittsburgh chapter meetings and other Society services also are available to the group.

The first permanent officers, elected in November, are: S. J. Bernath, chairman; Albert Dvorsky, first vice-chairman; John L. Schwartz, second vice-chairman; John Patrick, secretary; and Elmer Ranko, treasurer.

The Westinghouse tool engineers issue an attractive illustrated paper to keep their members informed of group activities. Membership has increased steadily and now numbers 47.

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Chapter listings include member as well as meeting news.

Committee responsible for successful ladies night party at Mid-Hudson chapter included, from left, front: Joseph L. Petz, H. S. Tesmer, James Hillis, Joseph Spahn; Henry Beiderbecke, Joseph A. Crane, chairman; standing: J. Harry Keller, Harry Sanctuary, George Vermilyea, Llewellyn H. Tenney, Charles Brownell and John L. Petz

Gives Pointers for Success as Management Executive

Poughkeepsie, N. Y.—How to become a successful management executive was detailed by Peter F. Rossmann, president of The Symington-Gould Corp., Depew, N. Y., in an address before a Mid-Hudson chapter meeting, March 8, at the Nelson House.

Speaking on "The Tool Engineer in Management," Mr. Rossmann stated that today's highly technical industries require more and more the specialized knowledge of the engineer as part of management.

Outlining the procedure necessary to prepare for a position in management, Mr. Rossmann listed these rules: Understand human nature; know your job; guard against snap decisions, but remember in some cases a poor decision is better than none. Keep a well developed sense of humor; stick to your job and don't meddle in others. Don't alibi; always tell the truth and you never have to remember what you said. Guard against jealousy, and don't indulge.

Keep Feet on Ground

Mr. Rossmann's formula for a successful executive is: Don't lose contact with your previous associates; don't be a snob; treat everyone with respect. Don't revolutionize procedures on the first day; adapt much and change little until you are thoroughly familiar with all phases of the work. Give credit where it is due; do all reprimanding in private, then forget it. Be above reproach at all times; remember to be cheerful and cultivate good manners.

Following his formal talk, Mr. Rossmann spoke briefly on the operation of rocket ships.

New officers were installed by Past Chairman John L. Petz. Those taking office were: Joseph L. Petz, chairman; Ellis Thorp, first vice-chairman; Harry N. Carlson, treasurer; Stanley P. Cook, secretary; and Llewellyn H. Tenney, delegate.

Chairman Petz appointed as committee chairmen: T. F. Luty, membership; C. H. Beiderbecke, program; H. J. DePew, publicity and editorial; J. A. Crane, dinners and entertainment; Robert Estes, education; James Hillis, standards; Raymond Lansing, constitution and by-laws; and Noel De Cordova, finance.

Conservationist Explains Work

Archie C. Petty, aquatic biologist of the New York State Conservation Department, gave a coffee talk prior to the technical session. Mr. Petty explained functions of his department in collecting physical, chemical and biological data on lakes and streams in order to overcome conditions causing disease and stunted marine life.

Past chairman pins were presented to John L. Petz and Llewellyn H. Tenney. Retiring Chairman Tenney presided.

* * *

Poughkeepsie Tennis Club was the setting for the chapter's recent second annual Ladies Night. Under the direction of a decorating committee, the hall was decorated in an engineering motif.

As the 158 members, wives and guests arrived, each group was met by a member of the Reception Committee and introduced to those already present. Dancing was enjoyed to the music of Russ Gilmore and his orchestra.

Each lady was presented with a gold compact as a surprise gift and door prizes were awarded to lucky ticket holders. During the latter part of the evening a buffet supper was served.

Officers Installed Amid Social Festivities

Springfield, Vt.—Annual installation of officers was occasion for a festive evening of dining, singing, and professional entertainment sponsored by Twin States chapter at Trade Winds Cafe, March 9.

William Hadfield, chairman, presided and William Farrell, a past chairman, conducted the installation ceremonies. Taking the oath of office were: Lee Davis, chairman; Hinkley Ranney, first vice-chairman; F. J. McArthur, second vice-chairman; George Julian, secretary; and Clifford Howe, treasurer.

Retiring Chairman Hadfield presented the chairman pin to Mr. Davis, his successor. The new chairman in turn pinned a past chairman emblem on Mr. Hadfield.

"Ace" Gorham, "The Merry Wizard," entertained with card tricks, feats of magic, and mental telepathy.

Guests included Carl Rici, Alec Lorinovich and Gerald Attridge of Springfield; R. D. Hamilton, H. E. Stockwell, and Arthur Howe of Claremont, N. H.; L. G. Kittredge of Windsor, Vt.; H. E. Berquist and F. W. Smith of Boston, Mass.

Atom Bomb Chief Speaks

Waterbury, Conn.—"Connecticut Night" will be observed jointly by Hartford, New Haven, and Fairfield County chapters, with an afternoon and evening program, May 20, at the Elton Hotel. Principal speaker will be Lieut. Gen. Leslie Groves, who directed the development and production of the atomic bomb. His subject will be "Implications of Atomic Energy."

A. H. d'Arcambal, vice-president—consulting metallurgist of Pratt & Whitney, West Hartford, is chairman.

The program will open at 3:00 p.m., with a technical session in the Elton ballroom. Thomas H. Chamberlain, manager of the Waterbury Mfg. Div. of Chase Brass & Copper Co., will be chairman.

S. C. Spalding, metallurgical engineer of the American Brass Co., will talk on "Tool Steels, Their Classifications and Applications." A second lecture, "Fabrication of Parts from Brass and Copper Alloys," will be given by John J. Hines, chief engineer of the Waterbury Mfg. Div. of Chase Brass & Copper.

At 6:30 p.m., dinner will be served in the ballroom, followed by General Groves' address.

Left: Ace Gordon, the Merry Wizard, entertains Twin States installation audience with milk disappearing act. Right: W. E. Farrell, past chairman, installs new slate of officers, from left: George Julien, secretary; L. M. Davis, chairman; H. H. Ranney, 1st vice-chairman; F. J. Arthur, 2nd vice-chairman; C. A. Howe, treasurer

Universal Friendliness Needed for World Peace

Rock Island, Ill.—"Broader Horizons for Tool Engineers" was the subject of a searching discussion before Tri-Cities chapter by A. E. Rylander, technical editor of *The Tool Engineer*. Mr. Rylander was the installation night speaker at a dinner meeting, March 2, in the Rock Island arsenal restaurant.

Emphasizing the value of the tool engineer and his place in this fast moving world of progress, he said, "Perhaps it's moving too fast. Why not stop and take a look in the direction in which we are heading? Do more than just stop—think!"

Mr. Rylander urged his listeners to read widely and discuss seriously world affairs. There is danger, he feels, that in our specialized work and small talk we are missing what persons in other fields are doing.

Under the skin, he went on, we are all alike; if we try to understand people whom we regard as enemies, hate will disappear and a world of peace will follow.

The speaker administered the oath of office to the recently-elected officers: Don A. Wangelin, chairman; Jesse L. Howe, first vice-chairman; Joseph Zelnio, second vice-chairman; Keith Saunders, secretary; and Robert Henning, treasurer.

Coffee speaker was Phillip J. Mackey of the U. S. Engineers, who related his experiences as a deep sea diver. He described the training of divers and conditions under which they work, and thrilled his audience recounting wartime adventures with the Navy and his present assignment on the Mississippi River with the U. S. Engineers.

Forms New Company

Detroit Mich.—Harvey G. Groehn, 1948 first vice-chairman of Los Angeles chapter, has formed Groehn Pattern & Spotting Fixture Co. in a new air-conditioned plant here. Associated with Mr. Groehn is Robert Brezney in charge of production.

The company specializes in engineering and construction of low temperature alloy clad body die spotting fixture frames, models and molds.

Before coming to Detroit, Mr. Groehn headed a Los Angeles firm.

Cleveland ASTE excursion party will see New York skyline from this angle in yacht cruise around Manhattan Island during sightseeing trip to America's largest city, July 1-4. Members from other chapters will be welcome

Cleveland Arranging Holiday Trip to New York City, Invites Other Chapters to Join Four-Day Excursion

Cleveland, Ohio—Do you live along the Cleveland-New York route or in or around Ohio? Then you're invited to join the Cleveland chapter ASTE trip to New York City, July 1-4.

Chairmanned by Andrew B. Clark, chapter secretary, the trip is by popular request of the more than 300 members and their families who participated in a special train excursion last fall to the Ford Motor Co.'s Rouge plant in Dearborn, Mich. This tour was conceived and promoted by Mr. Clark.

The Manhattan-bound party will leave Cleveland Union Terminal, Friday, July 1, at 9:50 a.m., EST. Accompanied by other ASTE'ers who board the train along the line, they are scheduled to pull into Grand Central Station at 9:45 p.m., via the reserved-seat Empire State Express. Chartered buses will be waiting to whisk them to the New Yorker Hotel for a refreshing night's sleep before starting the tour.

First-timers can get their bearings Saturday morning during a two-hour sightseeing tour—uptown, downtown, and Chinatown. At 2:00 p.m. the travelers will leave the hotel independently for an afternoon at Rockefeller Center. There the group will reassemble for radio and television tours. Intricacies of video will be explained and the tool engineers will see themselves televised.

Next stop is Radio City Music Hall for a motion picture and stage show, including a performance of the precision dancing Rockettes. For the evening, the visiting production men are on their own to "do" the surrounding theater and night club district.

Any hardy enough to make the 10:30 deadline next morning may walk two blocks east to the Empire State Building, be zipped up 102 floors with deafening speed, and clear their lungs in the brisk breezes off three rivers.

Picking up the morning laggards, th-y're off again at one o'clock for a three-hour sail around the island, with a leisurely view of the towers, bridges and other engineering marvels of Gotham.

Ice Show, Dancing Climax Visit

By 6:30 the hungry cruisers will be ready for dinner in the New Yorker's Terrace Room and eager for the ice show, and dancing to Charlie Peterson's band which will wind up the holiday junket.

Promptly at eight the morning of the fourth, buses will pick up the out-of-towners to entrain on the Empire, arriving back in Cleveland at 9:45 that evening.

Cost of this four-day vacation jaunt is approximately $70, including transportation, hotel accommodations, two breakfasts and Sunday night dinner and entertainment at the New Yorker, and all tours.

If you want in, and who wouldn't, just write to Andrew B. Clark at Haynes Stellite Co., 1517 Superior Ave., Cleveland 14, Ohio, or phone him at CHerry 5366.

Before taking off, you can bone up on what to look for and how to appreciate it in the April issue of *Holiday*. You may even sell yourself on spending your whole vacation seeing more of the seven million and their haunts.

Guest speaker A. E. Rylander, technical editor of The Tool Engineer, swears in Tri-Cities chapter officers, from left: Robert Henning, treasurer; Keith Saunders, secretary; Joseph Zelnio, second vice-chairman; Jesse L. Howe, first vice-chairman; and Don A. Wangelin, chairman. Elmer B. Benson, retiring chairman, watches the ceremony

Woman Heads Committee

Elmira, N. Y.—Sarah Swan, a tool designer affiliated with Elmira chapter, has been appointed chairman of the chapter Education Committee.

Miss Swan is believed to be the first woman to hold an office in the Society. She was the only ASTE member of her sex attending the Los Angeles convention last October.

Claims Grinding Permits Finishes of One Mu. In.

Montreal, Que.—At the March meeting of Montreal chapter, held in the Canadian Legion Hall, 86 members and guests enjoyed one of the most interesting lectures of the chapter season when Gordon T. Rideout, chief field engineer of the Norton Co., Worcester, Mass., delivered an address on "Recent Developments in Abrasives."

Mr. Rideout classified abrasives into two families—the Alundum group for grinding high tensile alloy and vanadium steels and the crystolon group for low tensile materials such as aluminum, brass, and steels with low nickel content.

"The harder the abrasive grain, the cooler the cutting action," the speaker stated. Hardness of grain, he said, as found in Alundum 38 for grinding heat-sensitive steels, is obtained by purifying the bauxite ore with an alkali before it is reduced in an electric furnace. Developed to retain wheel shape in form grinding, Alundum 57 has a grain that does not break down readily.

Finishes down to one mu. in. can be obtained by grinding, explained Mr. Rideout. Commercial average is about 15 mu. in. and these finishes are measured by instruments such as profilometers and surface analyzers.

The speaker pointed out that light oils such as spindle oil and kerosene for coolants, instead of water solubles, will give good finishes where loading conditions of the wheel are present. The oils lubricate the abrasive grains, allowing them to slide through the work without picking up materials.

"Alundum 32A, the newest abrasive, cuts faster and cooler," he went on, showing in slides and motion pictures how the grains stay sharp longer, giving more pieces per dressing and as much as four times the life of other wheels. Feeds also have been increased from 0.0005 per pass up to 0.002-0.006 on hard steels.

Mr. Rideout was introduced by Chairman M. A. Cote and thanked by Past Chairman G. W. K. Clark.

Atomic Project Engineer Explains Nuclear Fission

Windsor, Ont.—Technical speaker for a well attended meeting of Windsor chapter, held March 14 at Prince Edward Hotel, was K. F. Tupper, director of engineering for the Canadian National Research Council's atomic project at Chalk River.

Mr. Tupper outlined methods used to split atoms, supplementing his talk with blackboard sketches. His lecture and answers to questions were necessarily limited for reasons of security.

The meeting concluded with a showing of the beautiful but terrifying color film, "Operation Crossroads," documenting the atomic tests at Bikini. It was presented through the courtesy of the Canadian Westinghouse Co.

Kansas City officers were installed during annual dinner dance. From left: Raymond Skates, 1st v.-chm.; Warren Ricketson, secy.; Ward Osborn, retiring chm.; Samuel Waas, chm.; John Needham, 2nd v.-chm.; Ivan Nelson, treas.

William A. Thomas, new Windsor chapter chairman, receives the chapter gavel from Cecil G. Sampson, a former chairman, who installed the incoming executives. From left: Urban C. Crook, secretary; Albert E. Carley, treasurer; Mr. Thomas, William F. Tyson, first vice-chairman; Harold B. Chambers, second vice-chairman; and Mr. Sampson

Bues Speaks at Dallas

Karl L. Bues, ASTE director from Golden Gate chapter, addresses North Texas members concerning "The Tool Engineer and His Responsibilities." Mr. Bues also installed new chapter officers at a meeting in Caruth Hall, Southern Methodist University, Dallas

K.C. Officers Installed At Annual Dinner Dance

Kansas City, Mo.—More than 260 members, wives and guests enjoyed an evening of entertainment and dancing at Kansas City chapter's annual dinner dance in the President Hotel, March 1.

Following dinner, H. Robert Brown, a past chairman, installed incoming officers. Taking the oath of office were: Samuel M. Waas, chairman; Raymond E. Skates, first vice-chairman; John Needham, second vice-chairman; Warren H. Ricketson, secretary; and Ivan Nelson, treasurer.

A. J. Mirick, another former chairman, presented past chairman and chairman pins to F. W. Osborn and Samuel Waas, respectively.

A musical quiz show was presented by the orchestra and prizes were awarded to the 10 contestants. Other entertainment followed.

Past Chairman A. N. Brunson was in charge of a drawing of approximately 160 door prizes.

Advantages of Air Gage Stressed by Mahlmeister

Elmira, N. Y.—Members of Elmira chapter learned "The Modern Concept of Gaging Practices" as presented by Louis J. Mahlmeister, manager of gage sales engineering, The Sheffield Corp., Dayton, Ohio, at a meeting April 4 in Mark Twain Hotel.

Concentrating on air gaging, the speaker explained the basic usage of different types of gages and the accompanying tools.

The modern air gage, he described as a proved device of extreme accuracy that may be used: independently of operator skill; usually without the necessity of cleaning parts; with gaging pressures sufficiently low to avoid part deflection; without marring soft, polished surfaces; without loss of accuracy because of gage wear; and in places formerly inaccessible to precise gaging.

Industrial Executives Attend Installation

St. Louis, Mo.—Local industrial executives were guests of St. Louis tool engineers, March 3, when the ASTE chapter held its Executives Night at Hotel DeSoto. Approximately 300 members and visitors were present for the annual event.

Prof. H. L. Walker, head of the department of mining and metallurgical engineering at the University of Illinois and director of mines for the State of Illinois, addressed the gathering on the subject, "Education of Engineering Students."

While technical training is necessary, said Professor Walker, a young engineer needs personal integrity, initiative, industry and a spirit of cooperation in order to succeed. He stressed proper selection of subjects in high school, pointing out that many failures in the engineering profession are due to insufficient background. Engineering societies and clubs, he added, can be of great assistance to the young engineer.

Industry is always looking for the exceptional man, the speaker stated. In the fields of physics, chemistry and engineering, he cited a shortage of 15,000 Ph.D's.

I. F. Holland, retiring president of ASTE, was introduced by J. J. Demuth, national director, and reviewed the Society's history and growth to its present stature. Mr. Holland discussed benefits deriving from affiliation with the organization and plans for greater service to the membership.

At the conclusion of his talk, President Holland installed the following incoming chapter officers: W. G. Callies, chairman; Emil Stempfle, first vice-chairman; L. W. Greenblatt, second vice-chairman; E. P. Huchzermeier, secretary; and P. M. Hoffman, treasurer.

Conrad Installs Officers

Evansville, Ind.—The fourth administration of Evansville chapter was ushered in, March 14, at an installation dinner held at Evansville College.

H. E. Conrad, executive secretary from the national headquarters at Detroit, installed as officers for the coming year: Chairman, Walter Schneider, Servel, Inc.; first vice-chairman, Walter Stippler, Stippler Tool & Supply Co.; second vice-chairman, Charles Thuman, Servel; secretary, Roman Wannemuehler, General Tool & Die Co.; treasurer, Paul Wetzel, Servel; delegate, Clyde Yost, Ken Standard Corp.; and alternate, Harry Ferguson, Servel.

Mr. Conrad also addressed the group concerning Society operation, activities and plans for the future.

Another special guest was Norman L. Kniese, manager of the Manufacturers and Employers Association, who led the work of organizing the chapter three years ago. He talked on the importance of the chapter to Evansville industry.

Says Single-Point Tools Save Time, Reduce Costs

South Bend, Ind.—"Latest Developments in the Turning Field" was the subject presented by S. A. Brandenburg, vice-president in charge of sales at Monarch Machine Tool Co., before the March meeting of South Bend chapter, held at the Mayfair Restaurant in Mishawaka.

Mr. Brandenburg described in detail the development of single-point, template-controlled machine tools as built by his company. Advantages claimed for this type of tool are that it permits a quick setup and requires the checking of only one diameter by an inspector.

Tooling cost is low due to the single point; tool pressure also is low because of the small area of contact.

Douglas Inducts Officers Of Niagara District

St. Catharines, Ont.—Executive officers of Niagara District chapter for 1949-50 were installed by Robert B. Douglas of Montreal, ASTE vice-president since elected to the presidency, during a meeting, March 3, at the Barclay Hotel, Welland.

They are: N. B. Coleman, chairman; C. G. Bradford, first vice-chairman; F. W. Dunn, second vice-chairman; C. R. Mitchell, secretary; and R. A. Watts, treasurer.

Introduced by W. A. Dawson of Hamilton, national chairman of the Committee on Professional Engineering, Mr. Douglas outlined proposed activities of the Society for the coming year.

Chairman Coleman in his inaugural address urged a continual striving for better methods, greater efficiency and lower manufacturing costs in order to maintain our present standard of living. The letters, "ASTE," he added, might well stand for "Always striving for top efficiency."

Harry Whitehall of Hamilton, a member of the National Public Relations Committee, outlined what the Society is attempting in that field.

Technical speaker was P. E. Cavanagh, assistant director of metallurgical research, Ontario Research Foundation. His subject concerned the theory of atomic lattice structure of metals.

According to Mr. Cavanagh, we should be able to supply industry with equipment for a specific purpose, such as mine hoist ropes or jet engine baffle plates, with full knowledge of when, where and how it will fail in use.

However, this theory of metallic structure cannot be fully applied until the unknown factor "A"—micro-stress of material—has been found, a project on which his organization and industry are collaborating.

W. L. Sandham, a former chapter chairman, thanked the speaker on behalf of the chapter.

Slides Show Adaptability Of Air Hydraulic Power

Louisville, Ky.—Harry Stewart, assistant sales manager and chief engineer in charge of special designs, Logansport Machine Co., was the principal speaker at a dinner meeting of Louisville chapter, held at the Kentucky Hotel, March 9.

Mr. Stewart discussed the theory and application of air and hydraulics and their combination as applied to machine tools. Slides demonstrating the versatility of air hydraulics left the audience with the impression that the ingenuity of the designer was the only limiting factor in applying this type of power.

Forty members and guests attending the dinner meeting saw the following officers installed: N. H. Booker, chairman; S. F. Reichert, first vice-chairman; L. G. Gutermuth, second vice-chairman; J. R. Davis, secretary; and W. D. Wuest, treasurer. There were 69 present for the technical session.

Top: Guest industrialists at St. Louis annual Executives Night saw tool engineers install their new officers. I. F. Holland, retiring president, administers oath of office to: W. G. Callies, chairman; Emil Stempfle, first vice-chairman; L. W. Greenblatt, second vice-chairman; E. P. Huchzermeier, secretary; and P. M. Hoffman, treasurer. Below: N. B. Coleman, Niagara District chapter chairman, is congratulated by R. B. Douglas, now Society president, after Mr. Douglas performed installation ceremony. From left: R. A. Watts, treasurer; C. G. Bradford, first vice-chairman; Mr. Coleman, F. W. Dunn, second vice-chairman; Mr. Douglas, and C. R. Mitchell, secretary

Schwister Takes Office As Chicago Chairman

Chicago, Ill.—On March 8 Chicago members gathered at their new meeting place in the Western Society of Engineers club rooms. Highlight of the meeting was the installation of officers for the coming year.

Harold Taylor, outgoing chairman, administered the oath of office to: A. J. Schwister, chairman; Thomas C. Barber, first vice-chairman; Dale Long, second vice-chairman; H. Verne Loeppert, treasurer; and William R. Shrode, secretary.

Taking the chair, Mr. Schwister introduced E. J. Pavesic of the Lindberg Steel Treating Co. as technical speaker. His subject was "Heat Treatment of Tool Steels."

Mr. Pavesic, a chapter member, classified tool steels into six basic types and 56 grades. Tool steel, he said, should be free of all surface defects and completely annealed before hardening.

Cooperation between the design engineer and the metallurgist or heat treater, he added, helps promote balance among factors affecting heat treatment.

In designing tools and dies, small dimensional tolerances are usually permitted. If parts are finished to exact size before heat treatment, precise control is necessary to prevent or minimize growth, shrinkage and distortion.

Straightening was pointed out as one of the more hazardous operations for a heat treater, demanding a knowledge of transformation characteristics of steels.

Finds Man-Made Sapphire Superior for Industry

Rochester, N.Y.—"Sapphire Products and Their Uses in Modern Industry" was the subject presented to approximately 90 members and guests of Rochester chapter by Roger F. Waindle, general manager, Industrial Products Div., Elgin National Watch Co., Elgin, Ill. Mr. Waindle was the principal speaker at a meeting, March 7, at Rochester Institute of Technology.

Most of the 25 million sapphires used annually by industry come from foreign sources, said Mr. Waindle. Although the natural stones are tougher, manufactured ones are purer, harder and can be made in various shapes.

The synthetic jewels take a fine finish and are used primarily as bearings. Other applications include gages, rods, flats and thread discs.

Film Shows Making of Bearings

Along with his lecture Mr. Waindle presented a color-sound film on the production of jewel bearings. A slide talk compared synthetic and natural mined sapphire.

Before the technical session H. O. Simon greeted the group for the last time as chairman and introduced John Dense, a former chairman, who swore in the new officers.

W. R. Gordon, the 1949-50 chairman, then introduced his staff of officers and executive committees for the coming year. Mr. Simon presented Mr. Gordon with the chapter charter and gavel and the latter introduced the speaker.

Admiral Sees Dirigibles As Defense Sentinels

Newark, N. J. —Since the navy has failed to solve the question of further development of lighter-than-air craft, a Congressional study is the only hope for the program, according to Vice-Admiral Charles E. Rosendahl, USN (Ret.). America's leading authority on dirigible airships expressed this opinion in an address March 8 before a dinner meeting of Northern New Jersey chapter at Robert Treat Hotel.

Recalling a recent request of the air force for an "electronic fence" to warn this country of approaching enemy aircraft or guided missiles, Admiral Rosendahl pointed out that rigid airships can carry the most electronic equipment.

He illustrated his talk with a navy sound film depicting the development of rigid airships. The motion picture showed major disasters to such aircraft. These mishaps, he emphasized, resulted from errors in judgment, not through any inherent fault of the airship.

Charles Edison, president of Thomas A. Edison, Inc., presented the speaker. The meeting was designated Edison Night in honor of that concern.

The following chapter officers were installed during the evening: Chairman, John Epprecht, Boonton; first vice-chairman, Albert J. Schmidt, Bloomfield; second vice-chairman, James Allan, Hohokus; treasurer, Arthur Wotowicz, Rutherford; secretary, H. Wilson Ryno, West Orange; national delegate, Charles B. Carlson, West Orange; and alternate, C. Frank Sheely, East Orange.

Philadelphia Director Installs Denver Officers at Ladies Night

Wives were guests at Denver's installation ceremony, March 2, when incoming chapter officers took oath of office from T. J. Donovan, Jr., ASTE director from Philadelphia. Top, from left: Mr. Donovan, J. R. Matthew, chairman; W. L. Foss, first vice-chairman; W. G. Axtell, second vice-chairman; B. A. Carpenter, secretary; B. L. Golden, treasurer; B. J. Hazewinkel, retiring chairman and delegate; and C. J. Helton, alternate. Mr. Donovan also entertained the gathering with his popular "Silver Dollar Quiz" program

National Secretary W. B. McClellan was installing officer at March meeting of Erie chapter. New officers inducted are from left, standing: Edward Norgren, secretary; John Van Kampen, second vice-chairman; and Joseph Holmi, treasurer; seated: A. E. Weingard, chairman; Mr. McClellan and Stanley Sadoski, first vice-chairman

Installs Erie Officers

Erie, Pa.—W. B. McClellan, ASTE national secretary, visited Erie chapter March 1 and installed incoming officers.

In the presence of 46 members and guests Mr. McClellan administered the oath of office to: A. E. Weingard, chairman; Stanley Sadoski, first vice-chairman; John Van Kampen, second vice-chairman; Edward Norgren, secretary; and Joseph Holmi, treasurer.

The national officer from Detroit briefly described the construction of the new headquarters building there and stressed the importance of securing new members for the Society.

Technical speaker was J. R. Miller, vice-president in charge of sales for Beaver Tool & Engineering Corp., Royal Oak, Mich. Mr. Miller used blackboard drawings to illustrate his lecture on "Practical Applications of Carbide Milling" and conducted a question period at the conclusion of his talk.

Guests included David Henderson, G. C. Wood and David Hanifin of Pittsburgh; William Barringer, C. W. Blanan, B. M. Cook, Edward Green, T. J. McCartney, W. J. Moser and H. K. Sears.

Industrialists Honored At New Britain Night

Hartford, Conn.—Hartford chapter held its fifth annual New Britain Night at The Hedges in New Britain, April 4.

Editor MacAvoy of the *New Britain Herald* welcomed the assembled members and friends in a brief address.

Main speaker was Clifford E. Stubbs, vice-president and director of Henry A. Loudon Advertising, Inc., Boston, Mass. Mr. Stubbs gave an amusing and unique chalk talk on an industrial design job for a universal product. He also showed colored slides of "before and after" designs of many products now in daily use.

Before the speaking program Clayton S. Parsons, chapter chairman, announced that the national semi-annual meeting would be held in Montreal and that the "Tool Engineers' Handbook" is expected in July. He reminded the group that tickets were available for the Connecticut ASTE Night in Waterbury, May 20.

William Jarvis, retiring chairman and chapter delegate, gave a brief and concise report of the annual meeting of the house of delegates in Pittsburgh.

Situations Wanted

ENGINEERING EXECUTIVE—36, with 13 years' experience—6 years as chief engineer and manager in charge of production, engineering and sales in metal-working and tool industry; 7 years on electrical, mechanical and power plant engineering for large electric utility. Extensive carbide tool and machine shop experience. Married; Cal-Tech graduate. Location immaterial. Box 165, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

TOOL ENGINEER—age 29, with 11 years' experience in tool design, engineering, processing, cost and time estimating, sheet metal and machine shop tooling and design, special machinery for drilling and milling, and design and development of carbide cutters for special jobs. Capable of handling design and checking for tool design. Married, prefer location in Middle Atlantic states. Please write to Box 166, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

MACHINE SHOP SUPERINTENDENT—Desires permanent position with progressive company. Thirty-one years' experience includes 11 years of supervision. Broad shop and tooling background, quality and production engineering, methods, time and motion study. Age 48, married, salary open. Complete resume on request. Please address replies to Box 167, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

METHODS OR INDUSTRIAL ENGINEER—Seeks position in these fields or as production supervisor. Experience includes five years in methods and in planning cost reductions, most recently as methods engineer in electrical appliance manufacturing. Prefers situation in East, but would consider other locations. Please write to Box 164, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

New Twin City Executives Plan Chapter Program for Coming Year

In the presence of a large attendance of members and guests, Twin City officers and committee chairmen were installed and charged with their responsibilities, March 16. The new executive group met March 21 to plan their activities. From left, seated: C. V. Lofdahl, alternate; C. E. Fasth, treasurer; P. S. Tobias, second vice-chairman; R. L. Martin, chairman; L. C. Blanchar, first vice-chairman; W. E. Boker, delegate; D. A. Reiner, secretary. Standing, committee chairmen: W. F. Sahlin, program; J. W. Schwartz, education; A. A. Zeise, public relations; Percy Aiken, constitution and by-laws; LeRoy Owen, editorial; G. L. Mackley, Standards; and P. A. Saari, membership

Frank Moran, Illinois Central Railroad public relations executive, tells Rockford ASTE'ers and local Jaycees how his company promotes better employee-management relations. Top, from left: Howard Nelson, retiring chairman; Thomas Walker, Jaycee president; Mr. Moran, L. E. Richmond, local I. C. representative; and Karl B. Kaiser, new ASTE chairman. Below: Tool engineers and business men exchange viewpoints during annual joint dinner

Charges Industry Neglect Of Human Relations

Rockford, Ill.—In their competition for markets, manufacturers vie in obtaining fine materials for their products, using the newest and best production methods, and in developing sales outlets. But they have overlooked one link in this setup—the human element—as indicated by the ailments afflicting labor-management relations.

Remedy for this, according to Frank Moran, public relations executive of the Illinois Central Railroad, is closer association between employer and employee and keeping workers better informed about company activities.

Mr. Moran stressed this in an address, March 3, before the annual joint meeting of Rockford chapter, ASTE, and the Rockford Jaycees, held at Schrom's French Room. His subject was "The Machine and Its Part—or Partner."

Skilled Workers Took Pride in Job

Half a century ago, he continued, many workers were immigrant craftsmen, proud of their skill. Working units were small and closely knit. Now, big corporations are impersonal, leaving a wide gap between the factory hand and his employer.

Mr. Moran related a successful program instituted by his company to instill employees with a sense of pride in accomplishment and to strengthen contacts all along the line.

This includes a news letter from the president, suggestion awards, inviting distant supervisors to visit company officials, employee service clubs, and courses in human relations for the supervisory staff.

The plan has paid dividends in increased production and lower costs, he concluded.

During the dinner which preceded the speaking program and a brief business meeting, Evert Jordan of the Jaycees led the approximately 100 members and guests of the two organizations in group singing.

Donovan Shows Students Heat Treating Methods

Philadelphia, Pa.—T. J. Donovan, Jr., ASTE national director, was host to 115 students for a lecture and demonstration of heat treating, March 22, at the Donovan Co. shop.

The program was arranged by the Education Committee of Philadelphia Chapter for the jig, fixture and die design students of the ASTE-supervised course at Spring Garden Institute and a group of students from Dobbins Technical Vocational School.

In a comprehensive discussion of heat treating, incorporating 10 demonstrations, Mr. Donovan described the equipment used.

Turning to steels, the speaker explained the SAE code, heat treatable steels such as oil, water, and air hardening types, and the hardening and annealing of each.

He also dealt with design of parts to be heat treated, case hardening, carburizing, nitriding and finishing of heat treated material, and methods of minimizing warpage during heat treatment.

At the conclusion of the lecture, refreshments were served. Attendance included a group of instructors from the two schools and James Barnes and Byron Gates of the chapter Editorial Committee.

Canadian Plants Hold Open House for T.E.'s

Hamilton, Ont.—Studebaker Corp. was host to Hamilton chapter for an afternoon tour of the local plant and an informal social hour at Fischer's Hotel, March 11.

A technical session followed, C. S. Finkle, works manager of the plant, introducing P. G. Hykes, experimental engineer with Studebaker Corp. at South Bend, Ind., as guest speaker.

During his address Mr. Hykes gave an illustrated review of the evolution of passenger cars since 1877. Designers and engineers, he said, are constantly trying to produce a car with smarter appearance and improved features. He described the designing and engineering of motor cars and the testing of new features on proving grounds.

For maximum performance, Mr. Hykes recommended, low pressure tires should be mounted on the new, wider rims.

Interest in automotive production was evidenced by a flood of questions from the floor. After the technical program, William Orlick, acting chairman, conducted a business meeting.

Walter Wood thanked the speaker for his presentation. Door prizes were distributed before adjournment.

* * *

On March 25 the members visited Massey-Harris Co., Ltd., at Brantford to see a streamlined foundry where high grade alloy and high tensile cast iron are cast on a production basis.

The tour also included the forge shop, assembly department, paint shop and inspection department.

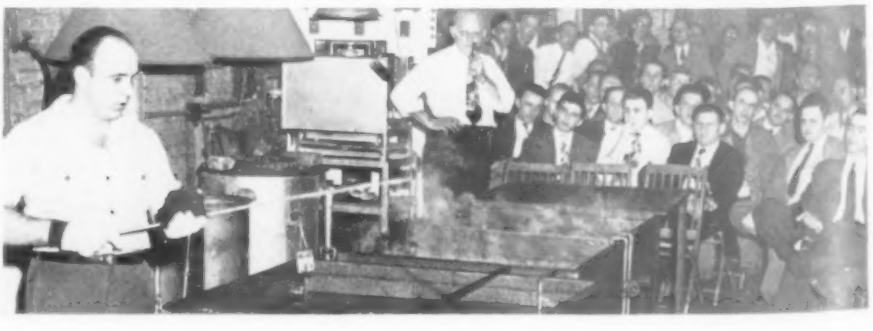
With the aid of such modern material handling devices as high lift trucks for palletized storage, underfloor conveyors for sand, overhead sand storage with spout for each moulder, the company's 630 employees cast 200 tons per day.

Kroll in New Post

New Haven, Conn.—J. A. Kroll of New Haven chapter, ASTE, has joined the Atlantic Saw Mfg. Co. here, as general superintendent.

Mr. Kroll was formerly chief production engineer for the Spotlite Corp. and technical consultant for the American International Transactions Corp., both of New York City.

T. J. Donovan, Jr. (with microphone) pauses in his lecture on heat treating while a member of his staff demonstrates points discussed before group of Philadelphia engineering students. The men were guests at his plant



New Administration Holds First Meeting

Pittsburgh, Pa.—Frank T. Boyd, new chairman of Pittsburgh chapter, and his officers conducted their first chapter meeting, April 1, at Fort Pitt Hotel.

Following dinner Chairman Boyd opened the business meeting by reading a letter from E. W. Baumgardner, national program chairman, complimenting the chapter for its work on the annual convention.

Walter Risser, retiring chairman and national delegate, reported on the house of delegates meeting, then transferred the chairman pin to Mr. Boyd. William Schott, a former chairman, presented a past chairman pin to Mr. Risser on behalf of the chapter.

After introduction of the new officers and committee chairmen, First Vice-Chairman Gay Wood presented the speaker of the evening, A. H. d'Arcambal, vice-president and consulting metallurgist of Pratt & Whitney, West Hartford, Conn. His subject, "Materials Used for Precision Cutting Tools and Gages," is

Left: W. H. Schott (back to camera), a former Pittsburgh chapter chairman, pins a past chairman emblem on Walter Risser, as he retires from office. Right: A. H. d'Arcambal of Pratt & Whitney describes materials specified for precision cutting tools and gages

one of perennial interest to tool engineers. Mr. d'Arcambal used slide illustrations and displayed an extensive collection of cutting tools and gages for inspection by the audience.

"Pick your tool steel to fit the job," the speaker advised during the subsequent question period.

Invention Humor Amuses Installation Audience

San Francisco, Calif.—Golden Gate chapter installed a corps of officers for 1949-50 at a meeting held March 15 at the El Curtola Club in Oakland.

Past Chairman E. J. Raves officiated as installing officer, performing an impressive ceremony. The new officers are: James V. Coulter, chairman; I. S. Minetti, first vice-chairman; G. B. Berlien, second vice-chairman; Sanford Wixson, secretary; and Basil Keys, treasurer.

Following the installation Mr. Raves presented the chairman pin to Mr. Coulter and a past chairman pin to Ernest C. Holden, retiring chairman.

Speaker of the evening was Edward Brosler, registered patent attorney. A Yale graduate electrical engineer, Mr. Brosler entertained the group with a discussion of "Humorous Aspects of Inventions."

Top: Edward Raves, former chapter chairman, inducted 1949-50 officers of Golden Gate chapter. From left: Mr. Raves, James Coulter, chairman; I. S. Minetti, first vice-chairman; G. B. Berlien, second vice-chairman; Sanford Wixson, secretary; and Basil Keys, treasurer. Below: At New Haven, Frank Shute, another former chairman, installs new executives of his chapter. From left: Mr. Shute, John Alton, secretary; Gerard Schoeller, chairman; Michael Radecki, first vice-chairman; David Mathewson, second vice-chairman; and Bernard Didsbury, treasurer

Recommends Carbides For Economy and Speed

Utica, N. Y.—"What the Tool Engineer Should Know About Carbides in 1949," was the subject of an illustrated lecture given by J. S. Gillespie, manager of tools and wear parts, sales engineering department, Carboloy Co., Inc., Detroit, at a technical meeting of Mohawk Valley chapter, March 29.

Held in the Technical and Industrial Div. of New York State Institute of Applied Arts and Sciences, the meeting was attended by more than 50 chapter members and 20 guests, including three visitors from Syracuse chapter.

In a comprehensive lecture Mr. Gillespie outlined the composition and fabrication of carbides, including their physical characteristics and properties. Carbides, he claims, often out-perform high speed steel tools in time and endurance, through ability to maintain hardness under extremely high temperatures.

Slides accompanying the lecture showed carbide applications to drills, boring tools, blanking punches and dies, granite carving pneumatic tools and granite boring tools.

A resumé of machine parts and appliances fabricated from carbides included a detailed description of parts such as carbide bearings for high speed equipment. Briefly the speaker discussed binding small diamond chips with carbide to fabricate wheel dressing diamonds, more economical than single diamonds.

Mr. Gillespie concluded his address with slides showing removable and repositionable carbide tool inserts having from six to 20 times the life of tool steel per single grind. These inserts are said to work faster than high speed steel tools.

After the lecture there was a short question period. E. J. Masucci, chapter chairman, presided and introduced the speaker.

Stainless Steel Cars, Study in Fabricating

New Haven, Conn.—Importance of tool engineering in building railway coaches and trailer trucks was emphasized by John C. Whitesell, superintendent of plant engineering at Edward G. Budd Co., Philadelphia, Pa., in a talk before approximately 50 members of New Haven chapter. Mr. Whitesell's subject for the March 10 meeting at Dunham Laboratory of Yale University was "Tooling for Fabrication of Stainless Steel."

Methods described by Mr. Whitesell included drilling, shaving, drawing, rolling, forming, bending and stretching. Photographs and charts illustrated these processes.

An animated discussion period followed his lecture. Mr. Whitesell substituted for T. J. Donovan, Jr. of Philadelphia, originally scheduled speaker, who was unable to be present.

Alton V. Pollard, retiring chairman, read his annual report. This was followed by the installation of 1949-50 officers: Gerard P. Schoeller, chairman; M. J. Radecki, first vice-chairman; David Mathewson, second vice-chairman; John H. Alton, secretary; and Bernard Didsbury, treasurer.

Frank A. Shute, a past chairman, administered the oath of office and Mr. Pollard presented the charter to the new chairman.

Named Representative

Philadelphia, Pa.—Tools, Inc., has been appointed exclusive Philadelphia representative for Illinois Tool Works, Chicago, according to an announcement by E. E. Valy, Illinois Tool sales manager.

Partners in the Philadelphia firm are D. J. Heckinger and Edmond Hollingsworth, both members of the local ASTE chapter.

Gordon Hall, retiring chairman of Hamilton chapter, introduces the new administration. From left: Mr. Hall, George Gilmore, chairman; George Churchill, first vice-chairman; William Peacock, second vice-chairman; William Shaw, third vice-chairman; John M. Snyder, treasurer; and John E. R. Yorick, secretary of the Ontario group

Modern Material Handling Saves Time and Space

Hamilton, Ont.—How material handling has progressed from backbreaking manual labor to mechanized movement of manufacturing supplies was related by E. B. Smith, manager of the materials handling division of H. C. Burton Co., Ltd., to more than 80 members of Hamilton chapter attending a recent dinner meeting at the Brant Hotel in Brantford.

Present methods of stacking tote boxes, Mr. Smith observed, conserve space and eliminate bins and numerous transfers of material.

Another interesting phase of Mr. Smith's subject was his description of modern methods of unloading freight cars. After showing several films, the speaker conducted a question period.

Chapter officers elected during the evening are: George Gilmore of Hamilton, chairman; George Churchill, Brantford, first vice-chairman; William Peacock, Hamilton, second vice-chairman; William Shaw, Guelph, third vice-chairman; J. M. Snyder, Brantford, treasurer; and John Yorick, Hamilton, secretary.

George Churchill, membership chairman, introduced several new members and presented each with a lapel button.

Mayor Walter J. Dowden of Brantford, a guest of honor, extended a welcome on behalf of the city.

Film Magnifies Action Of Cutting Tool, Coolant

San Diego, Calif.—With motion pictures W. L. Resler of the Cimcool Div., Cincinnati Milling and Grinding Machines, Inc., demonstrated to San Diego members how a cutting tool plows through metal instead of cutting, leaving a rough grainy surface, if no coolant is used. But as soon as the proper cutting fluid is applied, a smooth surface is produced and tool life is extended.

In his film lecture given before a recent chapter meeting, Mr. Resler explained that the pictures were made with the aid of a micro-lens.

During the meeting the following officers were elected: Chairman, G. S. Bunch of Rohr Aircraft Corp.; first vice-chairman, V. M. Pruyne, Production Tools, Inc.; second vice-chairman, C. R. LaCourse, Consolidated-Vultee Aircraft Corp.; secretary, V. A. Petricola, Ryan Aeronautical Co.; and treasurer, D. E. Pederson, Consolidated-Vultee.

Coming Meetings

BOSTON—May 12, all afternoon and evening. Open house and tour of General Motors assembly plant, Framingham. Tour starts 1:30 p.m.; dinner in the evening. June. Outing.

CENTRAL PENNSYLVANIA (York) — May 19. Ladies' Nite. Program to be announced. June 16. Stag party.

CHICAGO—June, date to be announced. Tour of Research Div., International Harvester Co., showing new methods of production being developed.

CLEVELAND — May 13. Joint technical society meeting. Society of Automotive Engineers, Tudor Arms Hotel. Dinner 6:30 p.m.; meeting, 8:00 p.m. Speaker: Hans Ernst, director of research, Cincinnati Milling Machine Co., Cincinnati, Ohio. Subject: "Chip Formation, Friction and Finish in Machining Operations." July 1-4. Trip to New York with privately conducted tours of the city, entertainment, yacht trip around the island.

DETROIT—May 12, Engineering Society of Detroit. Speaker: C. J. Reese, president, Continental Motors Corp., Detroit. Subject: "Tooling and Launching of Air Cooled Engines for Combat Vehicles." August 6. Golf Party, Indianwood Golf and Country Club, Lake Orion, Mich.

ERIE—June 18. Outing, General Electric Co. picnic grounds, Four Mile Creek.

GOLDEN GATE—May 17, dinner, 7:00 p.m.; meeting, 8:00 p.m., Fireside Restaurant, San Mateo. Speaker: Rexton S. Rainey, chief engineer, National Motor Bearing Co., Redwood City, Calif. Subject: "Manufacture and Application of Oil Seals."

INDIANAPOLIS—June 11. Golf tournament, L & N golf course.

NEW HAVEN — May 20. Connecticut Night, Hotel Elton, Waterbury. Joint meeting of Hartford, Fairfield County and New Haven chapters. June. Outing.

NIAGARA DISTRICT—June 2. Field Day.

PHILADELPHIA—May 19. Subject: "Hydraulic Control Equipment."

TRI-CITIES—June 4. Annual Smorgasbord, Camp Noble.

WINDSOR—June 3, 6:30 p.m., Lakewood Golf and Country Club. Annual Ladies Night—fun and prizes.

Parsons Takes Office, Appoints Committees

Hartford, Conn.—March 7 meeting of Hartford chapter opened with dinner at the City Club, followed by a business meeting, installation of officers and a technical session at the Hartford Gas Co. Auditorium.

Retiring Chairman William F. Jarvis presented Irwin F. Holland, outgoing president, who installed recently-elected chapter officers: Clayton S. Parsons, chairman; Donald B. Huntting, first vice-chairman; Robert M. Toppin, second vice-chairman; Henry E. Kuryla, secretary; and Robert F. Edmonds, treasurer.

After his induction Mr. Parsons announced the appointment of the following committee chairmen to serve during his administration: Bernard Blacker, membership; Charles A. Peterson, standards and data; Louis E. Eberts, constitution and by-laws; A. Douglas Proctor, publicity; Kenneth F. Thomas, public relations; Gerald H. Buker, editorial; Omar A. Gingras, technical activities; Edward T. Ross, education; and W. T. Allison, entertainment.

Photo courtesy Hartford Courant

William F. Jarvis, retiring chairman of Hartford chapter (right), congratulates his successor, Clayton S. Parsons as Donald B. Huntting, first vice-chairman, and Robert M. Toppin, second vice-chairman, look on

At the close of the business meeting, Lee H. DeWald, metallurgical engineer in research and development, National Cylinder Gas Co., Chicago, addressed the assembly. Mr. DeWald traced the development of hard metal compositions, describing methods for obtaining a satisfactory balance of properties in a cemented system to permit the widest industrial application.

He gave an overall analysis of factors to consider when contemplating use of carbides and discussed such industrial applications as heading, blanking, compacting and drawing dies, small tools, wear parts, cutting tools and contact points.

After dinner speaker was Elmer S. Watson, motor vehicle commissioner.

Rice Joins Blackford

Toronto, Ont.—A. McKinney Rice, former first vice-chairman and editorial chairman of Montreal chapter, has been appointed sales manager of the Ontario region by H. L. Blackford, Ltd., a Montreal chemical manufacturing firm. He is now located in Toronto.

Installation Ceremonies Inaugurate New Season

Philadelphia, Pa.—Installation of officers of Philadelphia chapter was witnessed by 207 members and guests attending the March 17 meeting in the Engineers Club.

T. J. Donovan, Jr., national director and a former chapter chairman, swore in the following executives for 1949-50: Emil Kitzman, chairman; R. S. Paulsen, first vice-chairman; Kenneth Riddle, second vice-chairman; E. O. Burton, secretary; Frank DeFrates, treasurer; P. A. Patterson, delegate; and A. R. Diamond, alternate.

Mr. Donovan presented a past chairman pin to Samuel Boyer, retiring chairman, and the chairman pin to Mr. Kitzman. The latter presented Mr. Boyer with a brief case as a gift from the outgoing administration.

Appoints Committees

Committee chairman and co-chairman appointments announced by Chairman Kitzman are: Constitution and by-laws, S. R. Boyer; editorial, Byron Gates and J. F. Barnes, co-chairman; education, H. W. Gross and A. R. Diamond, co-chairman; finance, George Baker and Mr. Gross, co-chairman; membership, A. B. Luecke and W. W. Cady, co-chairman; nominating, Clarence Duffany.

Program, R. S. Paulsen and Kenneth Riddle, co-chairman; public relations, W. V. Czarnecki, Jr.; standards, Harry Smithgall and E. A. Lund, co-chairman; register and reception, C. K. Lennig, Jr. and Mr. Duffany, co-chairman; good and welfare, P. A. Patterson; industrial relations, D. J. Heckinger; and scholarship, Mr. Patterson.

Technical feature was a symposium on bar broaching with C. S. Amadon of Connecticut Broach & Machine Co., New London, Conn., and George Squibb of Detroit Broach Co., Inc., Detroit, Mich., as speakers. Mr. Amadon discussed spline broaching and Mr. Squibb confined his remarks to surface broaching problems.

A color-sound film, "Surface Broaching Pliers in High Production," was shown through the courtesy of Cincinnati Milling Machine Co. A lively question and answer period followed the talks.

H. W. Gross, a former chairman, offered an invocation at the dinner preceding the meeting and Walter Phifer led group singing during the meal.

Mr. Boyer announced that the chapter had become an affiliate member of the Philadelphia Engineers Club and introduced Robert V. Hudson, chairman of the club. Mr. Hudson welcomed the group to his organization and explained benefits accruing from the association.

Director Donovan reported on the board meeting and Delegate Patterson gave an account of the house of delegates meeting at Pittsburgh.

Among guests introduced by Chairman Kitzman were: Prof. J. H. Billings of Drexel Institute of Technology, Gustav Von Reis, president, John Dustman, sales manager, Sigge Svenson, assistant chief engineer, and J. W. Kelley, representative, all of Detroit Broach Co. Mr. Kelley is also a member of St. Louis chapter, ASTE.

Accepts Symbol of Office

Harry Springer (left), Potomac chapter chairman, receives gavel from his predecessor, Daniel T. Hilleary

Toledo Tool Engineers Entertain Their Ladies

Toledo Ohio—Approximately 75 couples attended the annual ladies night dinner dance, one of the two major social events on the Toledo chapter calendar, held recently at the Secor Hotel.

Dinner was followed by dancing to the music of Whitey Gobrecht and his orchestra. At intermission numerous door prizes were distributed. Vocal selections were rendered by Mrs. Cyrus Sharpstein accompanied by the orchestra and by Albert Hage accompanied by Mrs. Hage at the piano.

Mr. Hage, Ralph Ford and Samuel Burgess delighted the audience with their impersonation of the Andrews Sisters.

The Entertainment Committee, headed by Mr. Ford, was in charge of the enjoyable event.

Philadelphia officers accept responsibilities as T. J. Donovan, Jr., national director, administers oath of office. From left: A. R. Diamond, alternate; P. A. Patterson, delegate; F. J. DeFrates, treasurer; E. O. Burton, secretary; K. W. Riddle, second vice-chairman; R. S. Paulsen, first vice-chairman; Emil Kitzman, chairman

Obituaries

Raymond E. Hall

Raymond E. Hall, 52, general superintendent of overall operations at Kellogg Manufacturing Co., a division of the American Brake Shoe Co., passed away March 12 at his home in Rochester, N. Y.

For 32 years Mr. Hall had been associated with the Kellogg Co., starting in the inspection department. He was born in Antwerp, N. Y., went to Rochester in 1914, and served in the army during World War I.

A charter member of Rochester chapter, ASTE, Mr. Hall was also affiliated with several veterans' organizations and the Industrial Group of the Rochester Chamber of Commerce.

George W. Emrick

George W. Emrick, 64, chairman of the board and former president of the Ettco Tool Co., Brooklyn, N. Y., died suddenly during the winter while vacationing at Palm Beach, Florida.

Mr. Emrick had been with the tool concern for 30 years. He was president for 10 years before heading the board in 1947. Earlier he had been associated with R. H. Emrick & Son.

He was an ASTE member in Greater New York chapter.

Tri-State Juniors Elect Iowa Student Chairman

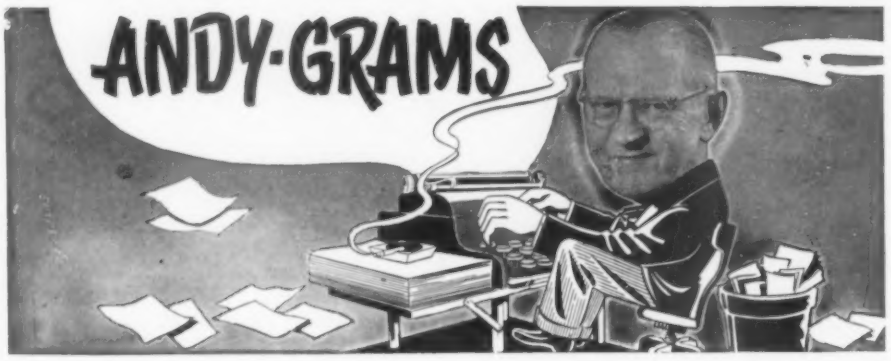
Angola, Ind.—Members of Tri-State College junior division of Fort Wayne chapter elected officers for the spring and summer quarters, March 10.

Wayne H. Vandesteeg of Storm Lake, Iowa, was elected chairman. Chosen to serve with him were: William Bowman, Romulus, Mich., first vice-chairman; Richard S. Hauffe, Lincoln, Ill., second vice-chairman; Melvin L. Kratzman, Toledo, Ohio, secretary; and Harry Wright, New York City, treasurer. All officers are mechanical engineering students.

Following the election and a business meeting, William J. B. Ingham, Jr., retiring chairman, introduced the technical speaker, H. Wayne Loer, director of employee relations at Bowser, Inc., Fort Wayne. In discussing "Engineering Functions in Employee Relations," Mr. Loer told the group that all graduating engineers should be better informed concerning employer-employee relations. Labor and management, he feels, should make greater efforts to understand each other.

Guests at the meeting included Emil W. Mellin and Leonard C. Roebel, past chairman, and John F. Davis, incumbent chairman, of Fort Wayne chapter. They spoke briefly on production problems encountered by their respective companies. After each talk there was a short question and answer session.

A film, "Tools and Rules for Precision Measuring," concluded the program.



COMING BACK to the Pittsburgh meeting, which I barely mentioned in the previous issue a/c so many other diversions, Fred Dawless put the bee on me to get another new member. When I asked him what he thought I'd been doing all these years, he said "this is a 'special' on the pink ticket." Well, that's different, so, having always been careful whom I've endorsed for membership—quality, y'know—I herewith invite Henning Freden and Nic Norden of Aro-Nat Tool & Die into the ASTE fold. Come on in, boys!

John Johnston, Portland Chapter, asked me to come and help 'em eat Maine clams. Well, that's bait hard to resist. An interesting session with Lee Cuson, Detroit, who introduced me to Carl Larsen from the Dominion. Seems Carl is making a combination door hinge and latch that should go over in a big way. Also, a get-together with Jay Edmondson, prof at Ohio State who, I understand, has been made Educational Ch'man by Bob Douglas. A good choice, like all of Bob's appointments.

As previously intimated, I came down with the flu during the meeting. Sure, nothing novel about that; what I'm leading up to is a dream I had—or maybe it was just a brainstorm. Anyway, it seems I had shuffled off this mortal coil and found myself in . . . well, the place had me worried for a spell a/c there were a lot of guys with horns wassailing around a huge table presided over by an old guy with whiskers and the biggest horns of all. By'n'by, however, I noticed that the horns were attached to helmets and that they called the big guy Odin. So then I realized that I was in Valhalla,

where daily may champions meet,
in wassail or combat and, wounded or slain,
shall meet on the morrow to battle again."

Just then the Old Man rapped for order. "I understand," he said, "that some of you birds would like to go back to your former existence, so as to wind up unfinished business. So, after the big battle tonight, those who are slain will wake up on earth in the time and place you left it." Then, as I raised my hand. "Well, who are you, and what do you want?"

"Please, sir, I was technical editor of The Tool Engineer and I'd like to go back and write just one more Column in which I could give credit to my co-workers on the editorial staff. What with trying to boost our 18,000 members I never got around to it except for casual mentions."

"Oh?" with a saturnine grin. "Well, we'll see if the pen is mightier'n the sword. Suppose you tangle with that big roughneck over there, the loser to have leave of absence." So there I was, matching an overgrown pencil against a cutlass—and well, you can imagine the result. All I remember about the fadeout was a flash of steel streaking for my head. Then I woke up. So here I am, back on the job, and here goes for what I should have done long ago.

First off, there's Bob Powers, our publisher these past four years and more. Now, Bob and I have had our li'l differences—as who hasn't?—but all the while we've been like 12 o'clock in trying to turn out a good magazine. And in time we got to know each other's worth. From several years of close association, I can only conclude that Bob is entirely capable, that he knows his business and that he is the gentleman under even the most trying circumstances. Also, I've found that he plays the game in a way that should leave no regrets in his own mind.

Then there's Clarence Etter, our Sales Mgr. No high pressure salesman but a plugger who gets results, Clarence sells on faith in his product and on faith in his customer. He's done a good job selling the one and in winning the respect and liking of the other. The guy's all wool and a yard wide, and I'm proud to know him.

The same goes for Jimmy Curran, our Production Mgr. Jim makes up the book, arranges the ads and even makes ad layouts at times and, come time to put the book to bed, just about works the clock 'round. A good worker for our money.

Next in line, Bob Steiger, our Art Director. Despite losing a few years running boats around to Murmansk during the late fracas, Bob lost nothing of artistry beside's which he's faster'n a streak of you-know-what when it comes to making art layouts. Another right guy.

Last but not least, and leaving out secretaries—who also rate honorable mention—and the male editors, we come to Doris Pratt, our ASTE News Editor. A hard and conscientious worker, Doris has her fingers tight on the ASTE pulse and, by now, has acquired such a grasp of technical write-ups that she could easily pinch hit as an associate on the technical section. She is to be commended for a chore that, month-in-and-month-out, is well written and interesting reading.

Well, I can now go back to Valhalla—that is, when the time comes—with a clear conscience for having paid tribute where it's due. As far as our editorial staff is concerned, it's been one of the most harmonious groups that I've ever had the pleasure to work with.

As the saying goes, "'tis human to err and divine to forgive", apropos which some genius invented a pencil with one end to write with and the other to erase with when we pull boners. So, we make amends for mistakes of commission or omission, and then go on to redesign "nearer to the heart's desire."

It's that way with the ASTE. Fast growing and still young, there's been plenty of chances for mistakes. But on the whole, such as have occurred have been of the mind, not of the heart. It's like driving a car; no matter how good your intentions, there's always the chance that sooner or later you'll run a red light or a stop street. And if your record is good, you'll probably get away without the fine.

Well, I've been a member now going on 17 years, during which I've been in fairly close touch with most of the Society administrations. And if, in the minds of any of you boys North, East, West, South there exists even a remote doubt regarding the innate goodness of the Society, let me say right here that I've met few if any men, in any walk of life, who on the whole have been more honest or more altruistic in their regard for their fellow men than the men who have guided and who now guide the ASTE. So now, with mutual trust in each other's worth, let us go on to project the Society to greater heights!

Andy

THE TOOL ENGINEER'S *Service Bureau*

FREE BOOKLETS AND CATALOGS CURRENTLY OFFERED BY MANUFACTURERS

Ball Bearings, "Cartridge"

Twenty-eight page booklet, describes applications of ball bearings; discusses dirt protection, grease type, content and retention, advantages of running without relubrication. Includes charts of dimensional data, load rating, etc. *Norma-Hoffmann Bearings Corp.*, Stamford, Conn.

Band Saws, High-speed

Eight-page catalog describes 13 high speed band saws ranging from "utility" model weighing 425 lb to precision model weighing 5,640 lb. Lists representative materials that may be contour cut as well as techniques used. Specification chart simplifies data. *DoAll Company*, Des Plaines, Ill.

Bearing, Linear Motion

Twelve page bulletin describes line of ball bushings—ball bearings for linear motion. In addition to a description of operating principles, the booklet lists design advantages, and includes data on seals, lubrication and installation. *Thomson Industries, Inc.*, Manhasset, N. Y.

Burs, Carbide

Carbide burs for use in high-speed portable tools are described in four page catalog. Accuracy, speed and low unit cost are claimed for the burs. *The Atrax Co.*, Francis Ave. and Day St., Newington 11, Conn.

Cylinders, Air

Catalog section No. 53 describes the Gerotor line of air cylinders. Design of the booklet is towards helping the engineer to lay out his circuits, and drawings and tables are furnished showing dimensions. *Gerotor May Corp.*, Baltimore 3, Md.

Drillers and Tappers

Line of Model C Holesteel Type B adjustable multi-spindle general purpose drillers and tappers described in 20-page indexed bulletin. Includes charts of adjustable and slip-type spindle data in addition to floor plans and specifications. Dept. 56, *National Automatic Tool Co.*, Richmond, Ind.

Gear Shaver

Four page bulletin describes National's universal diagonal gear shaving machine, which, the bulletin states, extends the scope of gear shaving and offers increased speed and overall economy. *National Broach and Machine Co.*, 5600 St. Jean, Detroit 13.

Heaters, Resistance

Four page bulletin describes resistance heaters for controlled sectional heating for forging, bending, brazing, hardening and annealing. The unit will heat 7 to 8 lb per kwh at 2300 deg F, it is claimed, with greater economy at lower temperatures. *Agnew Electric Co.*, Milford, Mich.

Lift Trucks

Bulletin 4883 describes improved line of Barrett lift trucks with capacities of from 1000 to 15,000 lb. Features of the trucks are illustrated, and a chapter of the 28 page booklet is devoted to selection of the proper model. *Barrett-Cravens Co.*, 4609 S. Western Ave., Chicago 9.

Machine Accessories

Catalog 77-U, 28 pages, covers line of machine tool accessories and attachments —more than 130 different types, from collets and carriage stops to toolholders and electric motors. *South Bend Lathe Works*, 417 East Madison St., South Bend 22, Ind.

Magnets, Alnico

Bulletin B-1205A describes non-electric Alnico magnets in general duty, heavy duty and extra strong models. A wide variety of applications are cited in removal of tramp iron from coal, sand, chemicals and other materials. *Dings Magnetic Separator Co.*, 4740 W. McGeogh Ave., Milwaukee 14.

Pneumatic Devices

Bulletin CL-15, 12 pages, provides a brief description of products included in Bellows' line of pneumatic devices, including feeds, vises, presses and valves. *The Bellows Co.*, 222 West Market St., Akron, Ohio.

Pulleys, Magnetic

Two catalogs recently released on magnetic pulleys. No. C-1001A, eight pages, covers line of electromagnetic pulleys; No. C-1007A describes the Perma-Pulley, designed for efficient use of alnico. *Dings Magnetic Separator Co.*, 4740 W. McGeogh Ave., Milawukee 14.

Shafting, Flexible

Catalog 49, 16 pages, covers wide line of flexible shafting and flexible shaft machines from small to heavy-duty equipment. Accessories are included in the catalog. *Elliott Manufacturing Co.*, 350 State St., Binghamton, N. Y.

Shaper, Openside

Bulletin No. 300, eight pages, covers current model of Rockford's 36 in. openside hydraulic shaper. Table speeds range from 0 to 110 fpm on the machine, which features hydraulically powered table drive and tool feed. *Rockford Machine Tool Co.*, Rockford, Ill.

Steels, High Speed

Analyses, heat treatments and applications for five most commonly used high speed steels are covered in a recently-released 12 page bulletin. Charts showing hardness values after heat treatment are included. *Jessop Steel Co.*, Washington, Pa.

Surface Roughness

Eight page bulletin, illustrated, describes the advantages provided by shop control of surface roughness and waviness. Basic requirements for system of control of irregularities on machined and finished surfaces are outlined. *Physicists Research Co.*, 321 South Main St., Ann Arbor, Mich.

Taps

Recently released is a 111 page catalog and handbook for users of taps. In addition to describing Besley's 28 taps, the book includes a reference section which covers classification of fits, tap drill sizes, cutting speeds and lubricants, and screw thread terms and definitions. *Charles H. Besley & Co.*, 118 N. Clinton St., Chicago 6.

Tools, Form

Four page brochure covers line of cut-off and form tools, and includes series of blanks for all automatic screw machines using circular form tools. *Production Service Co.*, 1060 Broad St., Newark, N. J.

Tubing Data

The Babcock and Wilcox Tube Co. has available five tables which include tolerances of round seamless tubing; Metric conversion table; linear conversion table; wall thickness data for seamless and welded tubing; and hardness conversion tables. Address the company at Beaver Falls, Pa.

Wrenches, Torque

Ten-page catalog of torque tools explains advantages of automatically-limited torque in tightening bolts, etc., in assembly or repair. *Jo Manufacturing Co.*, South Gate, Calif.

TOOLS OF TODAY

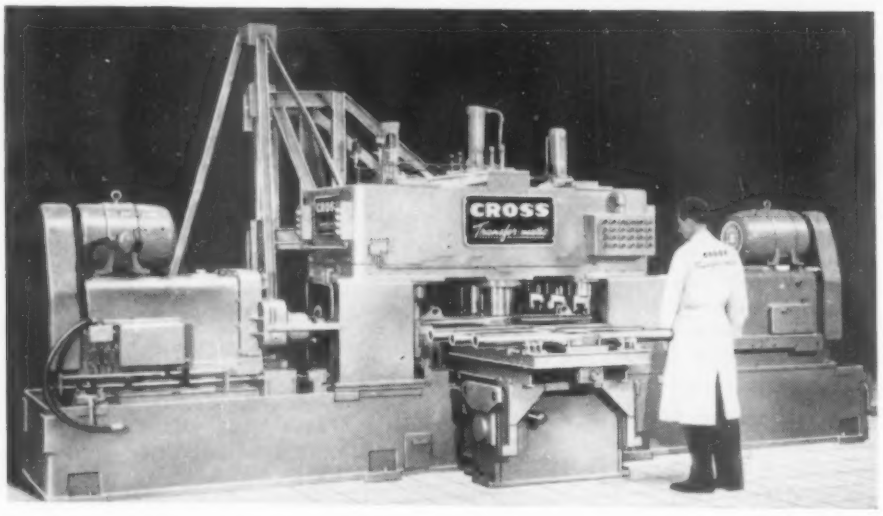
3-Way Multi-Grinding Machine

Processing 32 holes every 45 seconds in a 6-cylinder, cast iron alloy block is the purpose of a 3-way, automatic Special-Purpose machine announced by Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit 7, Mich. The process comprises counterboring six exhaust valve insert holes, taper reaming six inlet valve passages from the top, counterboring one hole for Welch plug, countersinking two holes in the rear end of the block and countersinking 17 holes in the front end of the block.

Clamping is hydraulic and the work cycle automatic. The cylinder block is loaded onto an elevator platform and lowered down over solid locating pins, then clamped at both ends by two hydraulically-operated wedge clamps.

High speed steel tools are used throughout at speeds ranging from 60 to 90 sfpm. Tool feeds are variable, permitting the application of the machine to blocks of varying composition. The two horizontal heads have a stroke of 10 in. and the vertical 12 in. The left and right horizontal heads have 5 hp and 7½ hp motors, respectively, and are mounted on slide units.

The vertical head is powered by a 15 hp motor and is mounted on a slide unit on special wishbone type column with standard, counter-balance weight set-up. The wishbone type column allows space directly behind the block for mounting of an additional unit from the rear, if desired for future applications, and also allows for easy removal. **T-5-2**

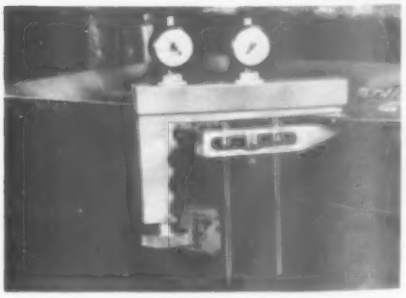


Transfer Machine for Axles

A machine tool which bores and faces three types of automotive axle housings without changing the set-up is announced by the Cross Co., 3250 Bellevue Ave., Detroit 7, Mich. At 100 percent efficiency, 280 parts are said to be processed hourly by only one unskilled operator.

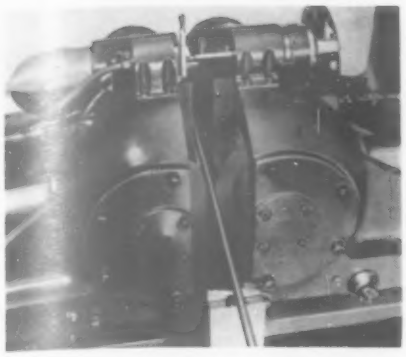
The machine is a 3-station, transfer-type unit—or Transfer-matic, as Cross calls its machine tools equipped with material handling devices to automatically move parts through recurrent operations—in which three types of axles come to the machine in two different lengths. At Station 1, any of the three of these are loaded; at Station 2, both ends are bored and faced with the machine automatically adjusting for length through an electric eye setup. At Station 3, the parts are automatically sorted by type and placed into either one of two conveyors, depending upon subsequent processing requirements. One conveyor, traveling at right angles to the machine, receives all axles with insulator brackets attached, either long or short; the second—a continuation of the flow of work through the machine—receives all other axles.

Because the unit is made up of standard Cross sub-assemblies, flexibility for part design changes is provided. Other features include hydraulic feeds, hardened and ground steel ways, and automatic push-button controlled working cycle. **T-5-1**



Portable Hardness Tester

A portable Hardness Tester for Rockwell readings, by Riehle Testing Machines Division of American Machine and Metals, Inc., East Moline, Ill., weighs only 3 lbs., yet it said to compare in accuracy with bench type testers. The tool is designed for hardness testing of raw materials and production parts that cannot readily be taken to the bench for testing. **T-5-3**

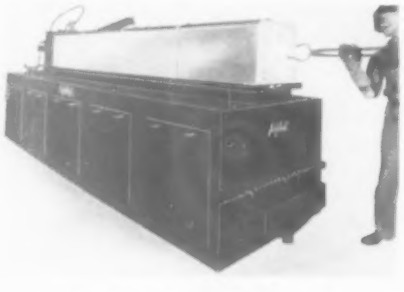


Precision Thread Roller

Watson-Flagg Machine Co., Inc., 845 E. 25th St., Patterson 3, N. J., announces an addition to its line of Precision Thread Rollers in the form of a heavy-duty Model C with increased work capacities and ability to roll continuous threads, knurls, or serrations. While only the "heart" of the machine is shown here, a heavy, sturdy frame allows for 72 percent higher hydraulically-applied rolling pressures to accommodate higher physical properties of material, greater diameter and pitch thread sizes, as well as increased length of work.

The machine is designed to take diameters from .138 in. up to 4 in. with a maximum of 8 pitch. Its regular length of thread capacity, when through-rolling is not being used, is 2¼ in. standard, 3¼ in. maximum. It is claimed to handle any material that has an appreciable percentage of elongation.

Threads, knurls or serrations are formed as the blank is rotated between two large cylindrical dies of 6½ in. average diameter designed to provide high surface rolling speeds—200 to 540 feet per minute—and an average 20.4 in. of useful circumference which factors combine to provide maximum output and die life. **T-5-4**



Induction Heater

Said to deliver a 2-½ x 3-15/16 in steel blank every 4.8 seconds right to the mouth of the forging machine at a closely controlled 2200 deg F, an Ajax-Northrup heater announced by Ajax Electrothermic Corp., Trenton 5, N. J., permits the operator to flip the billets into the dies at high production rates without extra steps or conveyor systems.

Blanks are fed into a chute at the far end, from which they are automatically fed into the heating coil by a hydraulic pusher. As each cold billet is pushed into the far end, a hot billet is pushed out at the press end. Timing is fully automatic, and it is claimed that practically any production schedule can be accurately paced by the heater which, with simple adjustments, can be set to heat any length of slug up to the maximum stroke of the ram. The heaters shown will accommodate square or round billets up to 2-½ in. dia.

The coils are interchangeable, and smaller or larger diameter coils may be substituted to give greater efficiency on long-run small diameter work, or to accommodate diameters larger than 2-½ in. Power source is a 700-kw., 960-cycle motor generator unit, of which 100 kw. is held in reserve. **T-5-5**

Chemical Fire Extinguisher

A dry chemical type Fire Extinguisher, announced by American-La-France-Foamite Corporation, Elmira, N. Y., is said to have outstanding advantages such as longer range, longer duration of discharge, more complete discharge of the dry chemical contents, gas-tight, all-internal expelling gas connections and built-in safety disc. It is also lighter in weight.

It is claimed that the dry chemical is nontoxic, noncorrosive, a nonconductor of electricity, and will not freeze. The unit, which has the Underwriters' Laboratories label is rated B-1 and C-1 and is recommended for flammable liquid and electrical fires. **T-5-6**

The Monthly Robertson Bulletin

TOOL SALVAGE

PRODUCTION COSTS are in everyone's mind these days. Tool costs, of course, have a very important bearing on production costs, and reconditioning tools can be a big factor in your drive for economy.

Reconditioning tools is not at all difficult, provided you have the right wheel. The ideal wheel is a Robertson "Cool-Cut." Because of the open structure of this wheel, the grains remove the metal rapidly . . . yet you obtain a finish equal to that produced by a close-grained, conventional wheel.

Here is one example of the sort of work a "Robertson" does on a tough reconditioning job. A 6" x ¾" high-speed milling cutter was re-cut in 15 minutes. A regular conventional wheel required 40 minutes to do the same job.

Another interesting reconditioning operation involves surface grinding steel-and-carbide reamer blades, inserted-tooth milling cutters and other carbide-tipped tools. The carbide tip and the steel can be ground in the same operation with the same Robertson Wheel without glazing the wheel or generating excessive heat. The depth of the cut varies according to the size of the pieces, but small reamer blades, for instance, can be successfully ground with .002" down feed and .015" cross feed. Robertson Wheels for this operation range from 7" x ½" to 12" x 1" in size.

For the best results from any grinding operation, make sure your grinding wheels are "Robertsons" . . . the wheels that are precision-built for the toughest jobs. Write for your free copy of the interesting pocket booklet "How to Buy Production Time."

ROBERTSON MANUFACTURING COMPANY

TRENTON 5, NEW JERSEY

Resin-Bonded and Vitrified-Bonded Grinding Wheels • Mounted Wheels • Segments

Contour Milling Machine

Designed for milling irregular contours on work parts from master cams, a cam-controlled Contour Milling Machine, by Sundstrand Machine Tool Co., Rockford, Ill., combines in one unit a vertical spindle milling head, a cam follower, a cam-carrying table and a rotary work table. The machine features a wide selection of automatic cycles for both internal and external milling of practically any contour on work parts up to 5 in. diameter. The operator is only required to unload, reload and start the automatic machine cycle. One time-saving feature claimed for the machine is its ability to cut master cams from sample parts, thus eliminating the engineering of intricate cam profiles.

The machine has a ¾hp milling head and a cam follower spindle which are mounted together on a swinging arm. Ratio between cam roller arm and cutter arm is 2 to 1, thus reducing cam error ½ on the finished part.

The cutter spindle is driven by V-belt, with infinitely adjustable speeds ranging from 425 to 4150 rpm. The cutter spindle head has 3¼ to 8 in. vertical adjustment from top of rotary table to spindle nose, and the spindle quill has hydraulic vertical feed with total movement of 1¼ in., controlled by dogs for rapid advance, feed and rapid return cycle. Adjustments for various diameters of work, cutter wear and depth of cut are obtained through micrometer adjustment of arm.

The 6 in. dia. rotary table and the cam-carrying spindle are both worm driven off the same motor at 1 to 1 ratio. Table feeds are variable from 0.2 to 5 rpm, with rapid rate 40 rpm. and table rotation in rapid approach, feed and return in either direction is up to 1 1/3 revolutions. The machine is said to have over 24 possible cycle combinations to handle many different kinds of workpieces. T-5-7

WOODWORTH

Cone Lok JIGS

MINNIE JIG—for small work in 2 sizes: 1″ x 1″ and 1″ x 2″ working area.

STYLE 3—up-clamp type for controlled depth of machining; sizes from 4″ x 6″ to 9″ x 12″.

STYLE 1—most popular design for average work; sizes from 2″ x 4″ to 6″ x 8″.

STYLE 4—engineered for larger work in sizes from 5″ x 5″ to 9″ x 30″.

ALL STYLES EQUIPPED WITH FAMOUS WOODWORTH "LIFE TIME" LOCK —ALL SIZES CARRIED IN STOCK

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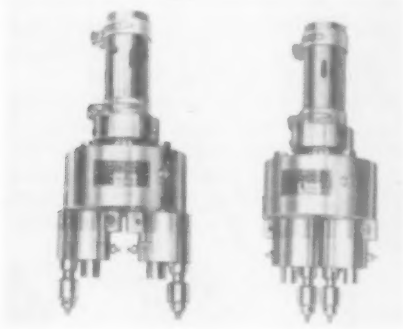
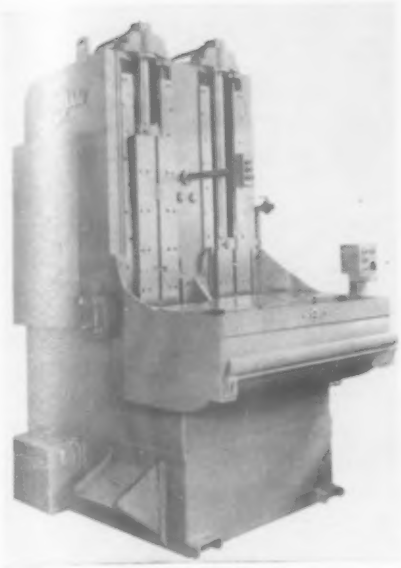
PRECISION GAGES · DIAPHRAGM CHUCKS · CONE-LOK JIGS · PRECISION PARTS



Adjustable Drilling Head

Errington Mechanical Laboratory, Inc., Staten Island 4, N. Y., announces the improved Errington Adjustable Drilling Head. This tool is designed to take advantage of a wide range of adjustment without overhang, as can be seen in the contracted and extended settings illustrated. The head can also be supplied with three spindles for equal adjustment in line, and three, four, five or six spindles for equal adjustment in line as well as for equal adjustment on bolt circles. Range from 0 to 1½ in. drills.

The unit is fully geared, with needle bearings on all spindles in head, ball thrust bearings throughout, and bronze bushed. Sand cast aluminum case. All parts fully enclosed for pressure lubrication and protection, with non-slip positive clamping on all adjusting members. Descriptive literature available on request. T-5-8



Dual-Ram Broaching

A complete line of Dual-Ram Broaching Machines comprising nine basic sizes has been announced by Colonial Broach Co. Box 37, Harper Station, Detroit 13, Mich. Designed specifically for surfacing broaching, the machine feature hydraulic and all electric control systems, a cycle control system said to virtually eliminate machine idle time for re-loading, and a forward-and-reverse jog cycle to simplify setting up among other innovations. The line includes the following sizes: 6-ton, 42 or 54 in. stroke; 10-ton, 42, 54 or 66 in. stroke; 15-ton, 48 or 66 in. stroke, and 25-ton, 48 or 66 in. stroke.

According to the manufacturer, the major objectives in design have been to: increase output efficiency by having the machine continue through its next cycle if the operator has finished loading before the first cycle is completed; increase accuracy of output by an improved table and column construction which gives more direct stress absorption; and to provide increased hydraulic capacity for occasional overloads by lowering the pressure at which rated tonnage is obtained.

With the all-electric cycling control, the machine can be set by means of the standard controls to operate on automatic continuous cycle; and single or semi-automatic cycle with pre-set control—that is the machine continuing into the next cycle without stopping if a button is pushed before the first cycle has been completed. Also, forward or reverse jog cycle, with ram and platen movements interlocked to prevent accidental damage to broach or part.

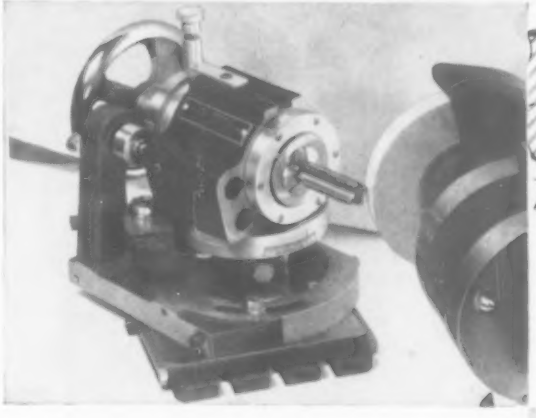
T-5-9

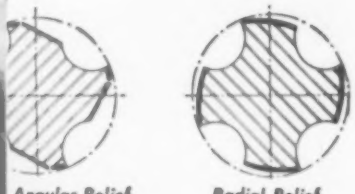
Laboratory Muffle Furnaces

A line of laboratory Muffle Furnaces, developed for a complete over-all temperature range from 300 deg F to 2000 deg F, by the Cooley Electric Manufacturing Corp., 38 S. Shelby St., Indianapolis 7, Ind., is designed for physical, chemical and industrial laboratory use for experimental testing, enameling, fusing, igniting, precipitate drying, and ashing. The line is further augmented by the Cooley Model ACL, and ACH recirculating air draw furnaces with built-in selective power modifier for temperatures to 900 deg F and 1200 deg F.

The Selective Power Modifier is essentially a synchronous motor-driven variable cam which operates an "ON" and "OFF" switch once each minute. The only power consumption is said to be in the motor drive. The cam position, controlled by setting knob, permits varying the "ON" and "OFF" intervals so that any power input from 5 percent to full power may be obtained. Control is obtainable from about 300 deg F to furnace maximum. **T-5-10**

Radially Relieved Cutters* are Better Cutters





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Lower in cost, easier to operate, more compact, better engineered.

Radial relief grinds taps, step drills, boring bars, counterbores, profile mills and a variety of special cutters.

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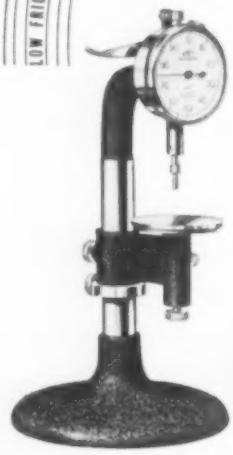
AMES

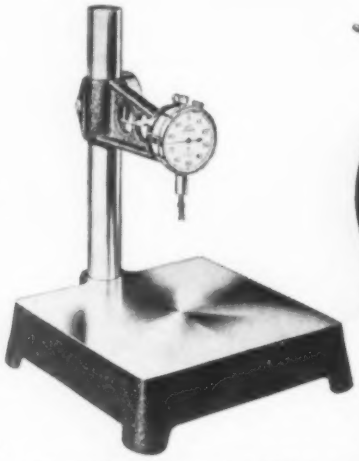
CONTINUOUS ACCURACY · RUGGED CONSTRUCTION · HIGH QUALITY MATERIALS · EXTREME SENSITIVITY · LOW FRICTION

INGENUITY PLUS - -

. . . the combination of Ames Dial Comparators shown below will allow you to handle practically all of your measuring and control problems.

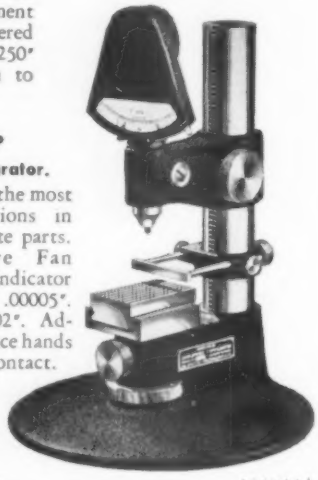


No. 1 Dial Comparator. This model has a table which is adjustable for height. The lever at left of dial is pushed down to lift the indicator rack spindle. Any Ames Indicator can be attached, but the one regularly supplied is Model 202 with dial numbered 0-100, reading .001", having .250" range.



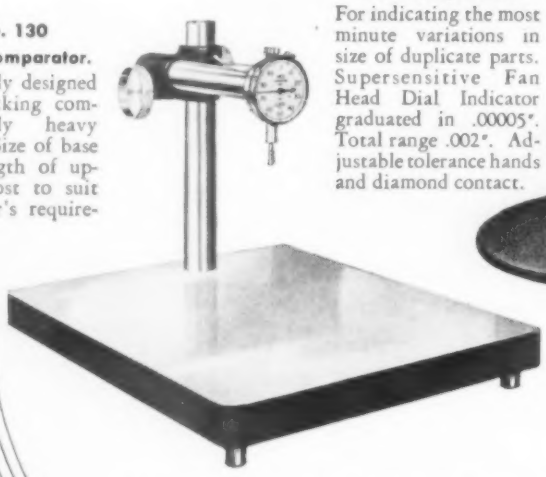
No. 13 Dial Comparator. The 8" x 8" cast iron base can be fitted with locating fixtures and V-blocks. The bracket supports any Ames Indicator, but regular equipment is Model 202 with dial numbered 0-100, reading .001", having .250" range. Bezel and dial turn to locate zero beneath pointer.

No. 2 Dial Comparator. Compact. Regular or dead weight contact pressure. Table dia., 2". Adjustable for "0" setting. Height 5⅜"; weight 2¾ lbs.



No. 26P Dial Comparator. For indicating the most minute variations in size of duplicate parts. Supersensitive Fan Head Dial Indicator graduated in .00005". Total range .002". Adjustable tolerance hands and diamond contact.

No. 130 Dial Comparator. Especially designed for checking comparatively heavy parts. Size of base and length of upright post to suit customer's requirements.



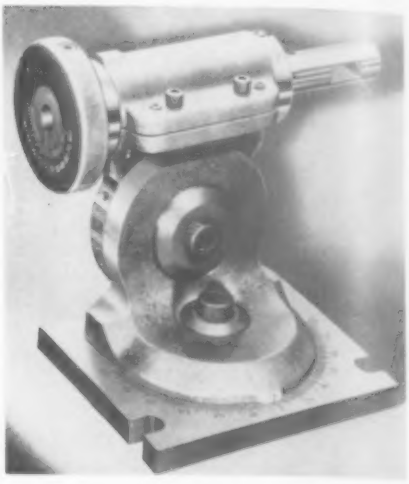
Address inquiries to Home Office, 30 Ames Street

B. C. AMES CO. *Waltham 54, Mass.*

MANUFACTURER OF MICROMETER DIAL GAUGES AND MICROMETER DIAL INDICATORS

Representatives in principal cities

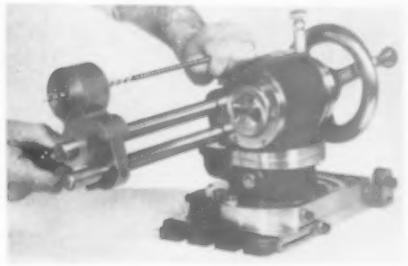
HARDENED STEEL GUIDEPIN AND BLOCK · FORGED BRASS CASE AND STEM · BURNISHED HARDENED BEARINGS · FORGED WHEEL SUPPORTS



Low-Cost Grinding Fixture

A low-priced cutter grinding fixture, which, according to the manufacturer, will handle a multitude of precision grinding jobs, has been announced by the Madison Manufacturing Company of Muskegon, Mich. The manufacturer states that it has been used successfully to grind cutting edges, steps, flutes and chip relief on Madison roughing and reaming cutters, milling cutters, chamfering tools, turning tools and reamers.

The Madison grinding fixture is graduated in degrees in all three planes. It offers automatic indexing for Madison tools and any other where 180 deg indexing is required. This automatic index feature can be released for conventional handling of other types of tools. T-5-11



Relieving Attachment

An accessory for the D-S Grinding Fixture, by Royal Oak Tool and Machine Co., 621 E. 4th St., Royal Oak, Mich., is designed for radial relief grinding of long tools not equipped with centers. Mounted on the bars provided as a standard part of the fixture, it holds the tool close to the end for grinding support. A clamp is also provided to give extra rigidity to the unit.

The attachment swivels on the top bar so that tools with large shanks can be inserted from the back without need of moving the fixture from set position when the same form is being ground on more than one tool. Standard drill bushings and liners can be inserted for any size tool up to 1⅜ in. diameter. T-5-12

Unit Bearing FHP-Motors

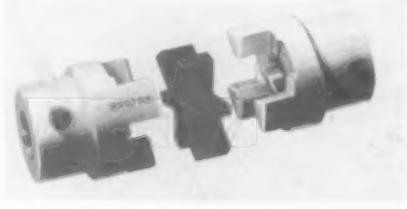
A line of unit bearing, shaded pole FHP motors designed for use on portable equipments has been announced as immediately available by General Electric's Fractional Horsepower Motor Divisions.

Designated as the Type KSP71, the motors are available in these ratings: 1/40 hp, 60/50 cycle, totally enclosed; 1/25 hp, 60 cycle, totally enclosed; and 1/15 hp, 60 cycle, open. All ratings are available for 115 volts or 230 volts and for CW or CCW rotation.

Suitable for use as drives for fans, blowers, and small pumps, the new motors have a die cast aluminum frame, with a resultant weight reduction over conventional types employing cast-iron frames.

Each of the three ratings can be used for horizontal or vertical shaft up operation; each can be obtained with identical outline features.

The models are available in a variety of mountings, including shaft-end, opposite shaft-end, and resilient-base, to permit equipment manufacturers to select those best suited to their manufacturing facilities or designs. The motors may also be band-mounted; a space 1-3/32 in. wide around the center of the stator is available for this type of mounting. **T-5-13**



Flexible Coupling

A Flexible Coupling, by Boston Gear Works, Quincy, Mass., features simple, accurately machined three-piece construction and an oil-resistant, synthetic rubber insert for quiet, flexible operation. The coupling is said to require no lubrication and is not harmed by oil, dust or dirt. Accurately machined and provided with standard keyways and set screws it can be used for a wide range of industrial applications requiring flexibility, ruggedness and durability. Designed for quick, simple installation and long, trouble-free service without attention, it is available for shafts $\frac{3}{8}$ in. to $1\frac{1}{2}$ in.

T-5-14

This newest Allen ○ Head product, made of Allenoy steel, meets all the demands of a dryseal plug in applications involving extreme pressure, such as in refrigeration and hydraulic equipment. For use with dryseal taps. No sealing compound required.

It stands up under repeated wrenching as no plug has before. Its Pressur-Formd socket, unweakened by drilling and broaching, is so strong the key will shear before the socket strips.

Pressur-Formd threading insures metal-to-metal contact all the way by producing burnished threads. This method prevents distortion and nicked, imperfect threads which gouge softer metals and impair the seal.

Accurate fit is assured by 360° roundness, and by a perfect taper, at both the pitch and crest diameters.

Here's positive protection against the high cost of leaky or faulty pipe plugs. Get "Tru-Round" Dryseal Pipe Plugs by ordering genuine Allens in the distinctive black and silver box.

Now available in sizes from $\frac{1}{16}$" to $1\frac{1}{4}$". No increase in price. Write us for samples and engineering data.

FOR NORMAL APPLICATIONS

Our "Tru-Round" standard pipe plug, also Pressur-Formd, is leakproof, and a sealing compound is not ordinarily needed for pressure-tight joints. Precise roundness and smoother threads make for better seal. Threaded strictly in accordance with Army-Navy Aeronautical Specification AN-P-363. Fully guaranteed.

WARNING
Allen-Type screws aren't necessarily Allen-Made. Get genuine "Pressur-Formd" Allen ○ Head screws in this black and silver box.

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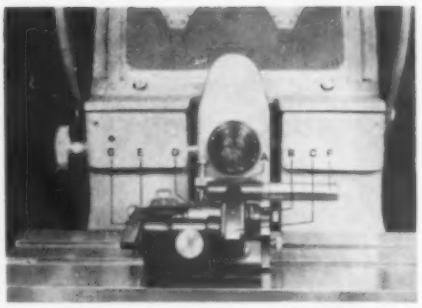
MANUFACTURING COMPANY
Hartford 2, Connecticut, U. S. A.
NEW YORK, CLEVELAND, DETROIT, CHICAGO, LOS ANGELES

ALLEN . . . . . FOR 40 YEARS THE BUY-WORD FOR SOCKET SCREWS

Universal Screw Stage

A Universal Screw Stage, by Jones and Lamson Machine Co., Springfield, Vt., checks at a glance pitch diameter and thread angle; crest, root and taper; and lead for the entire length of engagement of the screw.

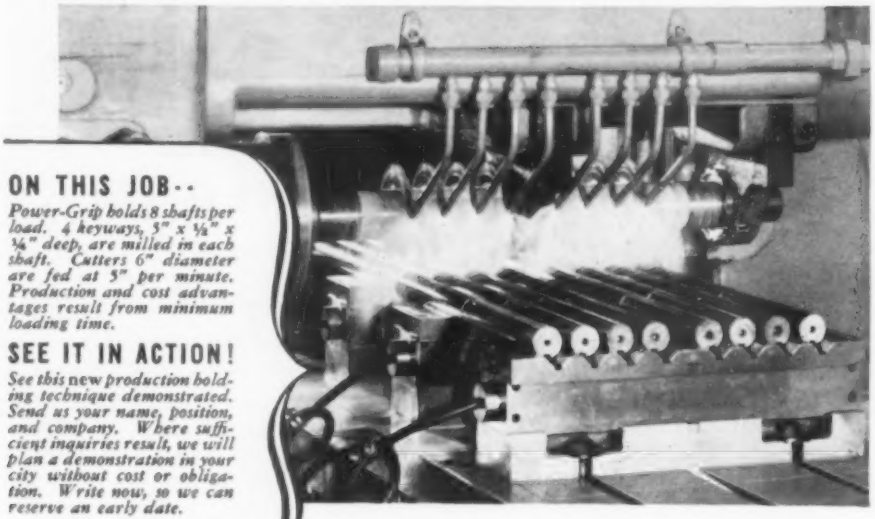
Designed for use with J & L optical comparators, the instrument is said to be as rapid as a snap gage and more positive than an elaborate set of pitch diameter, lead and form gages. The enlarged shadow reveals wear of tools, chasers, rolling dies or grinding wheel, not only as regards individual errors but accumulative effect as well.



A pair of rolls, corresponding to the thread to be inspected, is mounted on the roll shaft. The fixed roll is spaced longitudinally from the center of the lens, a distance equal to the length of engagement of its screw to be inspected. A master gage is staged on the rolls and supported and held by an adjustable backstop, "A", and a spring-operated clamp, "C".

The enlarged shadow of the master thread is then made to coincide with the correct tolerance outlines on the comparator chart. The space between the outlines represents the permissible tolerance for the class of fit required. Lateral displacement of the shadow shows lead error; vertical displacement shows pitch diameter variation. Provided with four pairs of rolls, the staging fixture accommodates any screw of a given form from 3/16 to 1 in. in diameter, and any pitch from 6 to 44, right or left hand. T-5-15

LOOK - NO CLAMPS!



ON THIS JOB--

Power-Grip holds 8 shafts per load. 4 keyways, 5" x ⅛" x ¼" deep, are milled in each shaft. Cutters 6" diameter are fed at 5" per minute. Production and cost advantages result from minimum loading time.

SEE IT IN ACTION!

See this new production holding technique demonstrated. Send us your name, position, and company. Where sufficient inquiries result, we will plan a demonstration in your city without cost or obligation. Write now, so we can reserve an early date.

—— *With* DEEP MAGNETIC PENETRATION
A NEW PRODUCTION HOLDING TECHNIQUE

That's right! Power-Grip Holding, with its Deep Magnetic Penetration eliminates the need for complex, expensive, holding fixtures, and grips securely odd shaped pieces otherwise normally difficult to hold.

Applied to milling, turning, shaping, planing, or grinding operations, this *new* holding technique is used for stout, high speed machining cuts. Get the complete story today. Write for a copy of our latest Bulletin, Magnetic Holding Methods.

Send us prints and specifications for estimates on Power-Grip Holding for your Production Jobs

ROCKFORD MAGNETIC POWER-GRIP CHUCKS

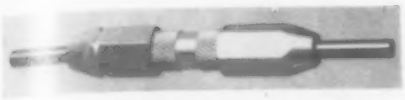
ROCKFORD MAGNETIC PRODUCTS CO. INC.
1304 18th AVE. ROCKFORD, ILLINOIS

Large Duplex Broaching Machine

Claimed to be the largest machine of its type built to date, a large duplex surface Broaching Machine, by American Broach & Machine Co., Ann Arbor, Mich., stands over 15 ft. high and weighs in excess of 35 tons. Stroke is 72 in., capacity, 40 tons.

Designed and built to broach large diesel bearing supports, the machine features automatic cycle of the left-hand table and right-hand broach arbor, both of which index six times in generating one complete broaching cycle. The left-hand station surface broaches the step joint faces in the six passes and the right-hand station rough broaches the half-round surface in six passes. The part broached weighs over 150 pounds and about ½ in. of stock is removed on approximately 110 square inches of surface.

The machine incorporates interlocked electrical controls and provides continuous cycle during the six passes necessary to complete one part. A chip conveyor handles the chips accumulated in broaching the part. T-5-16

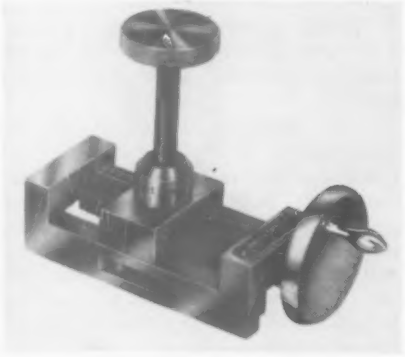


Reversible Plug Gages

Economy of operation and long-life accuracy are claimed as outstanding features of a line of reversible cylindrical Plug Gages recently announced by The Taft-Peirce Mfg. Co., Woonsocket, R. I. With these gages, the plug can be quickly and easily reversed whenever an end shows wear. The handle has a positive locking action so that the plug cannot slip, and the entire gage will have a rigidity equivalent to that of a solid gage.

The gages — AGD Standard — are available in sizes from 0.025 in. to 0.510 in. both "Go" and "Not-Go". They are furnished in alloy steel, high-speed tool steel, Carboloy or chromium plated.

T-5-17

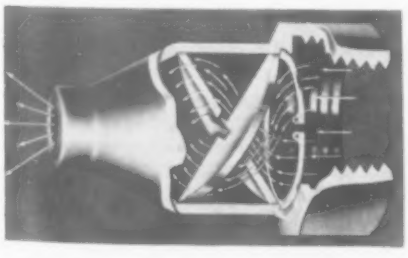


Grinding Wheel Dresser

A Wheel Dresser for surface grinders—Model A, by Natco Tool Co., 2834 W. Lake St., Chicago 12, Ill.—is designed to dress wheels from 1⅜ to 4¼ in. wide.

The attachment is said to eliminate stopping the machine, removing work from the chuck and lowering or raising the wheel head. It is easily attached and claimed to dress absolutely parallel with the chuck and while grinding.

T-5-18

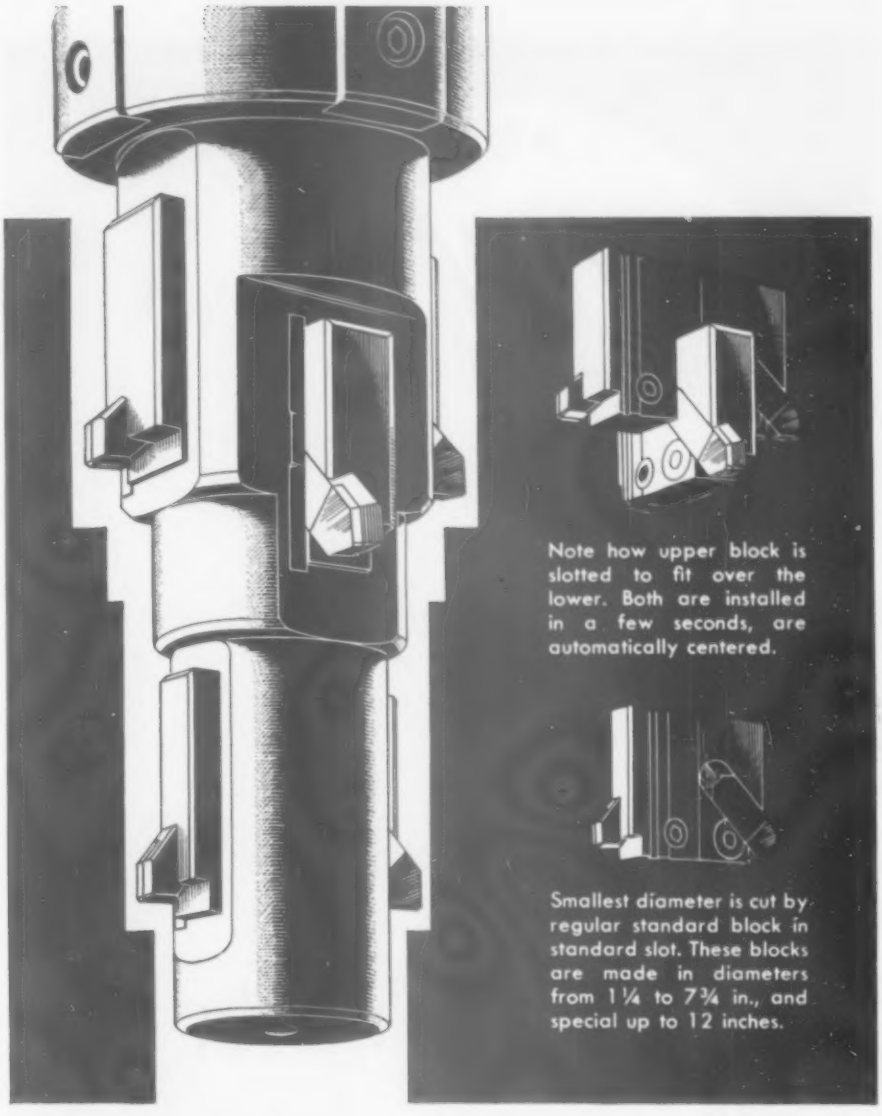


Industrial Spray Nozzles

Spra-Rite nozzles, by the Binks Manufacturing Co., 3122 Carroll Ave., Chicago 12, Ill., are designed for a wide range of industrial uses ranging from food processing to steel making.

Incorporating a non-clogging, helical vane principle, the nozzles are said to produce a uniform, full cone mass spray throughout the entire cross section of the spray pattern. Available in 17 sizes to fit ¼ to 2½ in. pipe connections.

T-5-19


Note how upper block is slotted to fit over the lower. Both are installed in a few seconds, are automatically centered.
Smallest diameter is cut by regular standard block in standard slot. These blocks are made in diameters from 1¼ to 7¾ in., and special up to 12 inches.

Gairing Boring Tools Boost Production

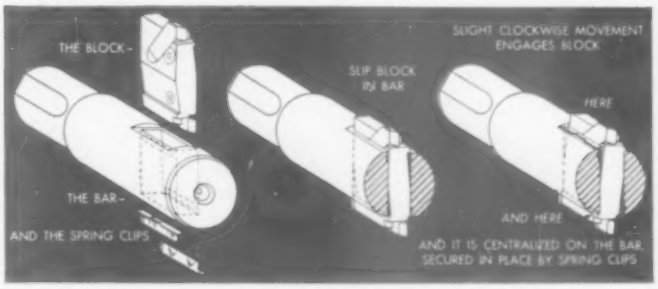
Quick-Change Blocks Save Man-Hours and Down-Time

Held in the boring bar without locating holes and screws, only GAIRING STANDARD BORING BLOCKS can be used in such applications as shown above.

The operation consists of boring diameters of 2.693, 2.228, and 1.875 inches in a tractor drive housing, cutting cast iron at a surface speed of 200 F.P.M., 0.020" feed per revolution.

Here, as always, blocks are pre-set to size, perfectly self-centered; always positively locked, rigidly driven. They are used extensively for rough boring as well as for semi-finishing and reaming operations.

Let us show you how GAIRING BORING BLOCKS may be applied to your problems.


THE BLOCK
SLIP BLOCK IN BAR
SLIGHT CLOCKWISE MOVEMENT ENGAGES BLOCK
HERE
THE BAR
AND THE SPRING CLIPS
AND HERE
AND IT IS CENTRALIZED ON THE BAR, SECURED IN PLACE BY SPRING CLIPS

Write today for the Gairing Block-Type Boring Tool Catalog

The GAIRING TOOL COMPANY, 21223 Hoover Road, Detroit 32, Michigan

A "Key" TO GREATER PRODUCTION... LOWER COSTS... MORE PROFIT...

Open the door to more profitable production by using W-S Standard Carbide Tipped Tools. Reduce inventories and procurement costs. Perform over 80% of your tool bit operations with only a few standard tools that can be used on more than one job.

Stock your tool crib with an assortment of W-S Standard Tools made with the grade of carbide best suited for your jobs. For certain special requirements, it is easy to alter a standard tool and eliminate costly "specials" which can be used on only one set-up.

W-S tools are "color-marked" for easy identification. Tool shanks are rust-resistant and made from highest quality steels. They are available from stock at your Wendt-Sonis distributor.

Free! NEW CHIP-BREAKER CHART

Contains illustrations of chip-breakers, grinding instructions and recommendations for their use. Chart size with tab for wall hanging. *Write:* Wendt-Sonis Company, Hannibal, Missouri, or 580 N. Prairie Ave., Hawthorne, Calif.; 549 West Randolph St., Chicago, Illinois — Warehousing facilities: Eastern Carbide Corp., 909 Main St., New Rochelle, N. Y.

WS WENDT SONIS

CARBIDE CUTTING TOOLS

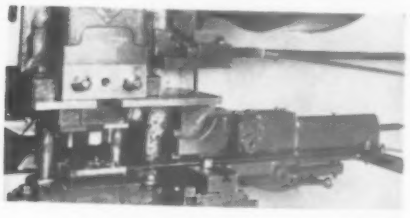
BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS
DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS
ROLLER TURNING TOOLS • SPECIAL BITS

Spring-Actuated Collet Chuck

Another application of the Erickson collet chuck is this spring-actuated, cam released set-up which speeds up polishing, grinding and other machining operations of a similar nature. Operator merely feeds and unloads machine.

Eight Erickson collet chucks are mounted on a multiple-spindle head. Chucking and release of parts is fully automatic. A cam releases spring tension on each chuck as it comes into unload and feed positions, then releases actuating-spring which collapses collet on to piece. Even, positive collapse brings entire surface of collet into contact with stock.

Further information may be obtained from Erickson Tools Division, 2311 Hamilton Ave., Cleveland 14. T-5-20



Automatic Punch Press Feed

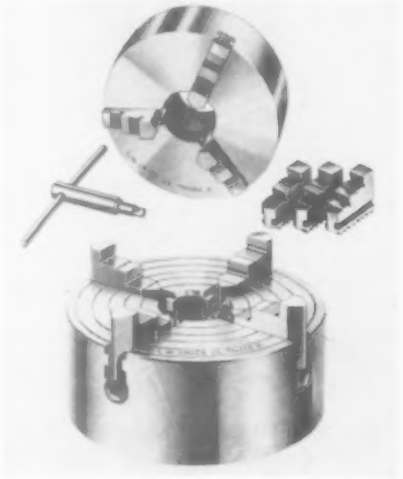
The Rol-Di-Feed, by H. E. Dickerman Mfg. Co., 321 Albany St., Springfield, Mass., is a compact and self-contained cam-driven feed for strip and coiled stock designed for quick installation in the general run of punch presses. Stated capacity is coils or short strips up to 3/16 in. thick where weight of stock does not exceed 2 lb per lineal foot. Maximum feed length 9 in. on presses with 3 in. or more stroke. Adjustable in increments of 0.001 in.

Open side design permits feeding of stock in a wide range of widths. Feed throughout most of the 360 deg of press shaft rotation advances stock at a comparatively slow rate of speed to enhance accuracy of feed when used in connection with progressive dies operating at high speed. The feeder is said to be particularly advantageous to feeding of deep drawing or forming dies. T-5-21

Larger Size Electrode

Large size diameter Electrodes, to handle heavy cast iron castings, is announced by Eutectic Welding Alloys Corp., 40 Worth St., New York 13, N. Y. Called Eutectrode 24/49, in size ¼ in., this rod with special Frigidarc coating is said to be particularly adaptable for overlaying large turbines, pumps, mixers, cylinder heads, housings, and other heavy types of castings requiring a heavier, more substantial electrode.

The rod also available in sizes 3/16, 5/32, ⅛ and 3/32 in. for all types of cold cast iron welding, requiring no preheating or dismantling of equipment. For use with either AC or DC machines, the electrode is said to have a uniform burn off rate, flows out rapidly and produces welds with tensile strength of 50,000 psi. and Brinell 150-200. **T-5-22**



Medium-Duty Universal Chuck

A five-inch medium duty Universal Chuck with two sets of jaws and wrench, and featuring three separate pinions instead of the usual single pinion, has been added to the regular L-W line of lathe chucks by L-W Chuck Company, 45 S. St. Clair, Toledo, Ohio.

Easy to operate, the chuck is said to permit greater accuracy and to afford less wear on the ring gear. The body is a semi-steel casting, highly ground, and the jaws are hardened with ground steps to assure a tight grip.

The chuck can be used on any lathe having 1-½ in.-8 thread spindle, including most models of Atlas, South Bend, Logan and Clausing although, by use of a conventional back adapter plate, it can be mounted on any size and type lathe. It also fits and is ready for mounting on the L-W 6-½ in. SD dividing head.

L-W Chuck Company also offers extra sturdy 6 in. and 8 in. independent 4-jaw chucks with reversible jaws, hardened and ground steps, and cast semi-steel body with ground finish. The chuck screws and bearings are made of tough steel and hardened for wear. **T-5-23**

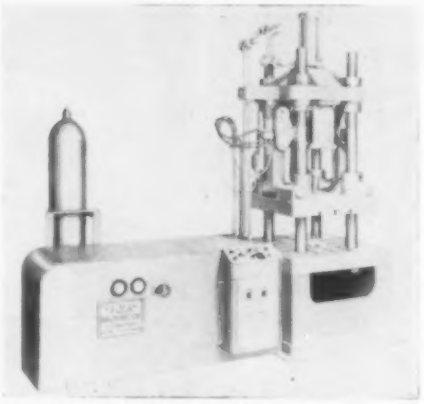
It's Practical & Profitable
to Mill Cast Iron
with Carbide
Super Carbide Cutters designed specifically for cast iron assure real economy! Standard sizes off-the-shelf and specials made to your print.
Write today for our catalog 47 A.
SUPER TOOL CO.
21650 Hoover Rd., Detroit 13, Michigan • 5210 San Fernando Rd., Glendale 3, California

Vertical Die Cast Machine

A cold chamber die casting machine of vertical-type construction is the Kux Model HP-22, recently developed by the Kux Machine Co., Chicago. It is designed specifically for production of parts which have cast inserts.

The machine has its die plates mounted in a horizontal position while its die plates operate vertically. Thus castings with inserts can be placed in the lower die half without difficulty, and the inserts remain in place all through the die casting cycle without falling out of their cavity placement.

Castings such as electric motor rotors, flywheel and magneto parts having magnet inserts, parts with bushings



cast in, etc., can now be easily made on this machine, whose vertical design eliminates the necessity for costly die construction to keep inserts in place.

Hydraulically operated and electrically controlled, Model HP-22 has a self-contained hydraulic operating mechanism and includes the injection pressure multiplier available for increasing injection pressure. Model HP-22 will produce castings weighing up to 4-½ lb in aluminum and has a die space of 17-¾ in. square between the bars.

T-5-24

Carbide Tool Grinder

Hammond Machinery Builders, Inc., Kalamazoo 54F, Mich., announces Model WD-10 Carbide Tool Grinder, designed for either wet or dry use. For wet operation, the baffle plate and exhaust outlet are turned to "off" position and the coolant system switched on. For dry operation, turn off coolant and open baffle plate and exhaust outlet.

The 10 x 19 in. tables equipped with a removable steel wear plate and table slot in which the compound protractor tool gage slides, have openings to allow for coolant drainage. Tables are quickly adjusted to any angle from 15 deg above to 30 deg below horizontal.

Safety cup disc completely fills the open cup of the wheel to prevent injuries or dropping of tools into cup of wheels; also very desirable safety feature.

T-5-25

A special hand finishing process and the extreme hardness of Rahn black granite permits a lasting surface guaranteed to .00005" accuracy. This rust-free surface will not warp due to shock or temperature changes. Literally millions of years of heat treating and normalizing by nature has produced a completely stress relieved material harder than hardened tool steel. If struck by a sharp object, no compensating bump will be raised on the surface. The super polished surface is free from abrasiveness and the action of instruments is velvet-smooth.

TAKE ADVANTAGE OF THIS FREE TRIAL OFFER TODAY!

We are confident that our surface plate will sell itself. Send us the coupon below and we will ship prepaid the Rahn Black Granite Surface Plate that you specify. Use it for a reasonable length of time and either send us your check or ship it back collect. You can't lose!

Size	.0001" Accuracy 2 Clamping Lips	.00005" Accuracy 4 Clamping Lips
12" x 18"	$59.00	$75.00
18" x 24"	118.00	150.00
24" x 36"	236.00	300.00

Prices F.O.B. Dayton. Information on sizes up to 54" x 108" furnished on request.

RAHN GRANITE SURFACE PLATE CO.
1149 PLATT CIRCLE, DAYTON 7, OHIO

FREE TRIAL OFFER!

RAHN GRANITE SURFACE PLATE CO., 1149 Platt Circle, Dayton 7, Ohio
☐ PLEASE SHIP PREPAID _____ *(fill in size and accuracy)* Rahn Surface Plate for _____ months *FREE TRIAL IN OUR PLANT.* I understand I am not obligated in any way
☐ PLEASE SEND MORE INFORMATION.
NAME _____
COMPANY NAME _____
ADDRESS _____
CITY _____ STATE _____

CLEAR

NAMEPLATE MARKING

The nameplate on your product is your signature; keeps it neat and legible! Accurate location and alignment are assured with this NAMEPLATE DETAIL PRESS.

- Simple Operation
- Perfect Alignment
- Uniform Depth

GEO. T. SCHMIDT, INC.
1804 W. BELLE PLAINE AVE.
CHICAGO - 13 - ILLINOIS

Special Purpose Machine

A special 2-way 42-spindle horizontal machine, by LeMaire Tool & Manufacturing Co., 2657 So. Telegraph Rd., Dearborn, Mich., incorporates a shuttle fixture for rough and finish boring large hole, facing ends, drilling, and reaming bolt holes from inside and spotfacing bolt holes from inside on a rear axle for a low-clearance delivery truck.

The shuttle fixture operates through three stations. At Sta. 1—which is also load and unload—the center holes of both right and left ends are rough and finished bored; also, the ends are faced, using a crossfeed tool.

At Sta. 2, six holes in end bolt circle are drilled and the center pilot hole rough counterbored, both ends. At Sta. 3, six holes in end bolt circle are reamed and center pilot hole combined, both ends. The center rear unit then tilts to spotface the 6 holes; from inside, at a 6 deg angle. **T-5-26**

MARK IT FOR MARKET

WITH GTS MARKING TOOLS

MODEL 175 HYDRAULIC MARKING MACHINE

FOR ROLLING lettering into flats, rounds, or irregular shapes.

FOR KNURLING fine line or diamond design on round pieces.

DEEP MARKING FOR PERMANENCE

HIGH PRODUCTION

Simply send prints of parts showing desired marking and its location, plus hourly production requirements for free recommendations.

GTS **GEO. T. SCHMIDT, INC.**

1804 W. BELLE PLAINE AVE., CHICAGO 13, ILLINOIS

It doesn't pay to PINCH PENNIES

on

CUTTING FLUIDS

IN selecting cutting fluids, performance — not price — is the important factor. Savings pinched out in purchasing are often thrown out in the scrap pile. A large Milwaukee screw products company learned this in machining Type 304 stainless steel tube stock on a single spindle Cleveland Automatic, using Tantung high speed tools. Of several cutting fluids tried for this operation, D. A. Stuart's ThredKut 99 with paraffin oil was found to be the only one which would enable the shop to produce this job at a profit.

On the forming operation, ThredKut 99 permitted production of 500 to 600 pieces per grind, as compared to only 100 to 135 with other oils; on drilling 300 to 400 pieces with ThredKut 99, only 75 to 100 with other oils; and 22 pieces per hour average with ThredKut, only 8 with other oils!

You can't get around performance records like these. Cutting oil at any reasonable price is a sound investment when it pays off in longer tool life, increased production and desired finish. You can buy cheaper oils and more expensive oils, but in this case as in most others, it is *wise economy* to buy the Stuart oil best suited for the job. Write for booklet, *Cutting Fluids for Better Machining.*

STUART *service goes with every barrel*

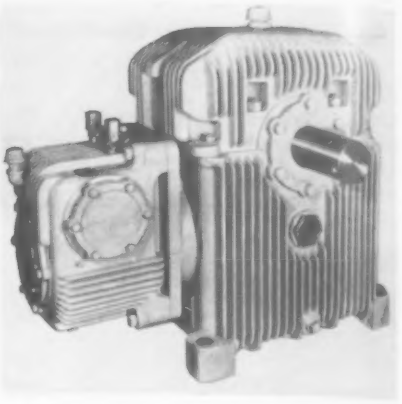
D. A. Stuart Oil Co.

2727-49 South Troy Street, Chicago 23, Ill.

Thread Cutting Broach

The Shearcutter Thread Cutting Broach, by Shearcut Tool Co., Box 746, Reseda, Calif., is said to generate a perfectly threaded hole by a true broaching action. The chips are curled up in one piece and flow out of the hole being threaded, an action said to prevent interference with the cutting action of the broach and breakage due to clogging.

Among advantages claimed for the shear cutting action is considerably lower torque required to form the thread, with consequent reduced breakage and increased tool life. T-5-27



Cone-Drive Reducers

By using standard speed reducers as primaries and secondaries, a line of Double Reduction Units comprising over 86,000 combinations as to capacity, model and ratio has been made available by the Cone-Drive Division of Michigan Tool Co., 7171 E. McNichols Road, Detroit 12, Mich. The combination of standard reducers is said to provide models with input ratings of from ½ to 68 hp, from 4,000 to 244,000 in.-lbs. output torque, and reduction ratios of from 25-to-1 to 4900-to-1.

An important advantage claimed for the setup is that it enables a low cost combination of standard units in such a manner as to meet all kinds of operating conditions—just as in "built-to-the job" double reduction reducers.

About the only major differences between the double reduction single reduction units is that primary gear shafts and secondary pinion shafts are slightly shorter. An adapter plate and flexible coupling connects the two reducers, while a special housing is used for the smallest of the primary reducers. Otherwise, all parts are standard and carried in stock at Cone-Drive for easy replacement and fast delivery.

Individual primary and secondary reducers are interchangeable and separately replaceable within given size ranges and may be dismounted and quickly converted to single reduction units if desired. Use of standard gear sets also makes it simple to change the ratio of any combination where and if desired since all gear sets and hearing mountings are interchangeable for all models of the same size. This facilitates maintenance replacement. T-5-28

Heavy-Type Grease

An aluminum-soda base Grease said to have an exceptionally high melting point is announced by E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia, Pa. The product is designed to meet a demand for a heavier grease-type lubricant and is designated Sta-Put 18H-2.

The main advantage claimed for the grease is that while it is a heavy waterproof lubricant, it possesses a melting point 100 degrees higher than that obtainable with a straight aluminum type grease. A product data sheet, prepared by Houghton, is available upon request. T-5-29

MEYCO
Patent App. For
ARE YOU Missing A BET ?
Users Say:
Pump Maker: "We have a jig setup where four holes are held to a limit of plus or minus .0005" on the spacing. MEYCO bushings were put into service . . . and, in five months, after completing 50,000 parts, the bushings show no appreciable wear."
Motor Maker: "The MEYCO bushings . . . have been working very satisfactorily. Our cost reduction report . . . shows the MEYCO equal to 12 former steel bushings. Total savings for this one project equals $230.00 per year."
Meyco Carbide Inserted Drill Jig Bushings
MEYCO bushings combine the best features of steel and carbide . . . the protection of steel with the long life of carbide at the points of wear. First cost: higher; end result: substantial savings in production expense. Made to ASA standards . . . MEYCO bushings will SAVE you money. Don't miss this bet! Some sizes now available from stock.
Write for bushing catalog No. 13, for further details and a price list.
MEYCO
W. F. MEYERS CO., INC., BEDFORD, INDIANA

Setup Accessories

Shown set up for use are Flanged Nuts, Stud Sets and Step blocks, introduced by Northwestern Tool & Engineering Co., Dayton 3, Ohio, at the recent 4th Southern Machinery and Metal Exposition in Atlanta, Ga.

The heavy-duty flanged nuts, designed to eliminate use of loose washers, range in size from 5/16 to 1 in. The stud sets include two additional sizes, one for the ⅜ in. T-slotted machines with 5/16 studs and one for 1 1/16 T-slotted machines equipped with 1 in. studs. The step blocks, graduated in 1/16 in. steps, are 2 in. thick, have a range from 3½ to 9 in. and may be had in cyanided steel or hard maple. **T-5-30**

New MERZ PICO Surface Comparator

eliminates human variables in surface control — takes exact readings electronically, right on the production line!

The new MERZ Pico Comparator checks surfaces the fastest, most accurate way known—*electronically, against a Master.* Eliminates human element entirely—gives exact, automatic meter readings on parts of all types in about 5 seconds. Makes production line surface control simple as routine dimensional gaging!

Unit is furnished complete with meter, exploring head and adapter. It is self-contained in a sturdy aluminum case, with carrying handle and storage drawer. Weighs only about 15 lbs. Can be operated from any standard 110-volt, 60-cycle line. Special heads and adapters available for the most intricate jobs.

It will pay you to investigate the many ways MERZ Pico Comparators can raise the standards of your surface control—cut your checking costs. First cost is remarkably low; savings continuous. Write for a demonstration in your own plant.

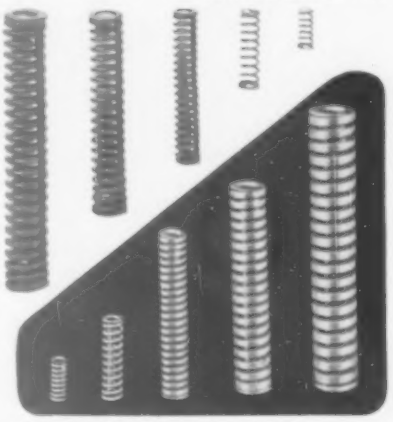
MERZ ENGINEERING COMPANY, INDIANAPOLIS, IND.

New-Matic Measuring Machines—New-Tronic Comparators and Sorting Machines—Standard A. G. D. and Special Gages—Tools—Special Machinery—Experimental Projects.

MERZ

DANLY DIE SPRINGS

MEDIUM PRESSURE—HIGH DEFLECTION TYPE



HIGH PRESSURE—MEDIUM DEFLECTION TYPE

2 INTERCHANGEABLE TYPES DESIGNED TO BETTER SUIT YOUR NEEDS

There's a Danly Die Spring especially designed to handle your complete range of die work. There is a medium pressure—high deflection type that provides desirable pressures for most jobs. For other work demanding greater pressures, the Danly high pressure—medium deflection type is provided. Both are interchangeable which makes it easier to solve your spring problems.

Manufacturing Standards Insure Long Life

Exceptional manufacturing standards are maintained in spring production. Springs are helical coiled from high quality alloy steel stock, heat treated. Spirals are held to close limits to provide even flexing and long life. Ends are squared by grinding, making the springs seat firmly when compressed. *Specify Danly Springs* for your die work as well as for other jobs.

ADDITIONAL TIME-SAVING SUPPLIES

"Kwik-Klamp" Toggle Clamps speed handling workpieces—effectively hold different sizes and shapes for light machining, welding, inspection, assembling and testing.

Precision Dowel Pins hardened and ground—can be driven without upsetting. Available in standard diameters and .001" oversize.

Socket Head Cap Screws including set screws, stripper bolts, and hollow pipe plugs made to close limits insure better fitting and positive tightening without shearing.

Valuable Information Free on all Danly tool and die makers' supplies. Obtain this helpful data now. Write Div. 598.

25 YEARS OF DEPENDABLE SERVICE TO THE STAMPING INDUSTRY

DANLY MACHINE SPECIALTIES, INC.

2240 So. 52nd Ave. Chicago 50, Ill.

DANLY

MECHANICAL PRESSES • DIE SETS • DIE MAKERS' SUPPLIES

Diffraction Instrument

An "Electron Diffraction Instrument", recently announced by General Electric's Special Products Division, uses a stream of electrons to study a layer of metal less than a quarter-millionth of an inch thick. The instrument is currently aiding engineers of the National Advisory Committee for Aeronautics in their search for better metals and lubricants for jet engines.

Developed by the company's General Engineering and Consulting Laboratory, the instrument is used to determine the effects of various lubricants and in friction studies of polished metal engine parts. Engineers explained that ordinary lubricants are not adaptable to high speeds and temperatures inherent in jet engine operation, and that new lubricants, therefore, must be developed.

With the instrument, engineers can detect in a few seconds natural films, which emanate from the steel itself, and chemical changes produced on the surfaces by lubricants. These chemical changes, it is said, are not visible under a microscope and formerly could not be detected with such equipment.

In operation, electrons are "boiled off" a white-hot tungsten filament and focused into a beam by a magnetic "lens". For one type of work, the beam then is passed through a two-millionths-inch-thick section of metal and produces an image on a fluorescent screen or on a piece of ordinary photographic film. In other applications, the beam is directed to a metal surface at an angle, where tiny projections on the surface diffract the electrons and form the image. T-5-31

THE HARD
WAY
GETS YOU MORE
Right—gets you more production—more for your money. For long wear and close tolerances specify OHIO WAYS. Uniformly hardened to Rockwell 64 to 66 C scale.
The OHIO KNIFE Co.
CINCINNATI 23, OHIO, U. S. A.

Direct Reading Dial

The Revodex direct reading Dial Indicator, by Van Dyke Instruments, Inc., 1401 Airway, Glendale 1, Calif., is adaptable to most types of lathes, milling machines and other equipment requiring precise table movement and accurate cutting tool adjustment.

In the main interchangeable with present dials, it permits direct reading up to 1 in. of travel. By means of intergearing between the two dials, it "counts" the number of revolutions up to limit of travel and permits instant readings of 0.001 in. and in 0.100 in. as well. Literature available on request. T-5-32

Improved Core Drill

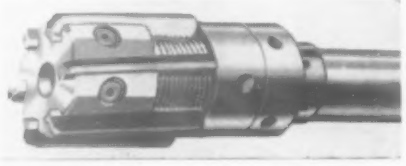
A Core Drill, said to eliminate the major objection to carbide tipped tools in core drilling operations, is announced as standard by Super Tool Co., 21650 Hoover Road, Detroit 13, Mich.

Strips of wear resistant metal, brazed on the entire length of the flutes, are said to eliminate the abrasive wear from cast iron chips on the body of the drill behind the carbide and to eliminate loading conditions which score the finished hole. Overall result claimed is increased core drill life and superior hole finish. T-5-33

Stock Feed Pusher

A Stock Feed Pusher for screw machines,—the Excel Master Pusher—is designed to feed bar stock without marring or scoring the surface while fully releasing gripping pressure on the return stroke after the collet closes. The tool is said to handle 90 percent of machine capacity.

The pads have a spherical radius on which the feeding stroke operates on a 2 deg angle in the master. This gives a collet-like grip on the bar. On the return stroke, this pressure is released when the angle moves away from the radius. Because of the slight contact a spherical radius makes on an angle, dirt that would ordinarily collect on pusher tubes is said to have no detrimental effect. Further particulars may be had from the Excel Screw Machine Tool Co., 25545 W. Warren, Dearborn, Mich. **T-5-34**



Carbide Tipped Reamers

A line of carbide tipped Adjustable Reamers, developed by the Wendt-Sonis Co., Hannibal, Mo., features replaceable carbide tipped cutting blades. One piece of carbide, heavily backed with high speed steel, runs the full length of the blade and cutting edges are diamond lapped.

Threads are precision ground for close blade adjustment, with a special safety lock-nut to permit easier replacement, positive locking of inserted blades, and maximum expansion for greater number of regrinds. The reamers are available in sizes from ⅝ to 4 in. with straight or taper shank, or shell type. **T-5-35**

Alloys Cutting Oil

An improved high sulfur ester Cutting Oil, said to be stable under all operating conditions involving the machining of stainless steel, all series, as well as chrome nickel alloys and monel, is announced by Oil Products Co., Inc., 4106 So. La Salle St., Chicago 9, Ill.

Named Excel No. 60, this oil is said to bring to industry the combined features of a superior finish and increased tool life with close limits readily obtainable at speeds and feeds above standard practice. For example, it is claimed that tool life on 18-8 steel is maintained as high as 8 hours, or more, at speeds of 125 sfm with no loading and with finish of superior quality. The manufacturer states that he will furnish trial samples on request. **T-5-36**

Productively Generate

SURFACE FLATNESS

and

PARALLELISM

MICROFLAT MACHINES

24 sets—48 parts—of these hardened Gerotor pump gears are finished simultaneously on a Model 844-2 MICROFLAT machine. The surface is optically flat and parallel within 0.0001 inches. Production is approximately 1200 parts per hour.

Double Surface MICROFLAT machines provide a high production method of generating parallelism between two opposite faces of a part, in one operation. This is accomplished by mounting a number of parts in fixtures which rotate about their own centers while turning around a pivot gear. Lapping plates, above and below the fixtures, revolve in opposite directions about the common center. This assures that every point on each surface will be abraded by the full area of the plate. Loose abrasive is automatically applied to the plates. The operation of these machines is simple and the results are consistently accurate.

MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT AVENUE, DETROIT 4, MICHIGAN

DISTRICT FIELD OFFICES.

1323 S. Santa Fe, Los Angeles 21, California
616 Empire Bldg., 206 S. Main St., Rockford, Ill.
55 George St., Brantford, Ont., Canada
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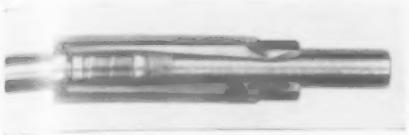

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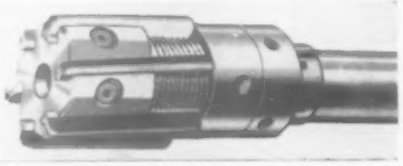

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Straightening and Assembling Presses

Recent development by the Oilgear Company, 1364 W. Bruce St., Milwaukee 4, Wis., include a 25-ton 2-column vertical Broaching, Straightening and Swaging Press, and a 25-ton Special Horizontal Assembling Press, both hydraulically operated.

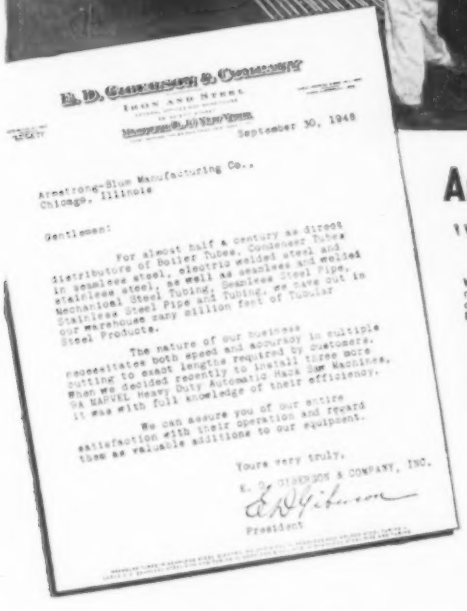
The horizontal machine has an adjustable tailstock said to be capable of resisting the full tonnage required for such operations as assembling a variety of propellor stub shafts in tubes, and rear axle tube assemblies.

Daylight is adjustable from 30 to 180 in. in increments of 3 inches. The tailstock is moved on hardened and ground ways through a handwheel, pinion and stationary rack, and two split steady rests, with locking levers, can be adjusted to any spacing within their range and clamped to the ways. Stroke is 17 in., with pressing and return strokes up to 114 and 242 in. per minute, respectively.

The vertical machine, which is suited to a wide variety of parts to be swaged, broached or burnished, is equipped with a hand lever operated spring-returned broach receiver basket and a hand lever and foot pedal control. An Oilgear Type DH-3525 2-way variable delivery pump, directly connected to a 25 hp electric motor, furnishes hydraulic power. Tonnage may be varied from 5 tons to maximum capacity.

General specifications of the press, which may also be used to straighten malleable castings, are as follows: Stroke 24 in.; daylight, 30 in.; distance between columns, and front to back, 24 in.; hole in table 9 in.; and table height 24 in. Ram speed down, variable up to 270 in. per minute; ram speed up, variable up to 540 in per minute.

T-5-37



E. D. Giberson & Company
FOOT OF IRON AND STREET
Hoboken, N.J. New York
September 30, 1948

Armstrong-Blum Manufacturing Co.,
Chicago, Illinois

Gentlemen:

For almost half a century as direct distributors of boiler tubes, condenser tubes in seamless steel, electric welded steel and stainless steel; as well as seamless and welded Mechanical Steel Tubing, Seamless Steel Pipe, Stainless Steel Pipe and Tubing, we have put in our warehouse carry million feet of Tubular Steel Products.

The nature of our business necessitates both speed and accuracy in multiple cutting to exact lengths required by customers. When we decided recently to install three more 9A MARVEL Heavy Duty Automatic Hack Saw Machines, it was with full knowledge of their efficiency.

We can assure you of our entire satisfaction with their operation and regard them as valuable additions to our equipment.

Yours very truly,

E. D. GIBERSON & COMPANY, INC.

President

Another Tubing Warehouse "Goes MARVEL"

Warehouses that are not equipped with proper sawing machines find that the cutting of steel tubing (especially the stainless types) is a difficult and costly job. But E. D. Giberson & Company, New York, have cut off millions of feet of all types and sizes of steel tubing to accurate lengths, economically and without difficulty, due to the fact that they have long been properly equipped with MARVEL SAWS. And because they have found MARVEL SAWS so trouble-free, so reliable, so economical to operate and so universally suited to all their cutting-off jobs, they have recently added this row of three new MARVEL No. 9A Automatic Hack Saws. With this additional equipment, they have expanded their facilities and can more promptly serve their fast-growing list of satisfied customers with steel tubing of all types and sizes, "cut to customer's specified lengths".

The local MARVEL Field Engineer will be glad to study your range of cutting-off work—whether it be in pipe, structural shapes, bars, or the toughest and largest alloy billets—and will then make recommendations on how you can improve your cutting-off operations to reduce costs and increase man-hour output.

Just write us on your letterhead: "Without cost or obligation on our part, send your local Field Engineer to look over our cutting-off operations".

MARVEL Metal Cutting SAWS
Better Machines—Better Blades

ARMSTRONG BLUM MFG. COMPANY

"The Hacksaw People"

5700 West Bloomingdale Avenue Chicago 30, Illinois

Turn to Page 88
for Handy
Tools of Today
Coupon

North East West South IN INDUSTRY

G. A. **Daum,** formerly with the Frigidaire div., **General Motors Corp.,** has formed the **Industrial Installations Co.,** with offices at 223 Central Ave., Dayton, Ohio. The firm will represent manufacturers in Ohio and Indiana.

Resistance Welder Manufacturers' Association, 505 Arch St., Philadelphia, announces the 1949 contest for papers on resistance welding. Offering $2250 in prizes, the association, in collaboration with the American Welding Society, further stated that the contest will close July 31, 1949.

Following the recent purchase of the **Arthur Colton Co.** of Detroit by **Snyder Tool & Engineering Co.,** Detroit, **Clarence Snyder,** board chairman of Snyder, announced the following appointments of Colton Co. officers: **Howard N. Maynard,** president and treasurer; **K. B. Hollidge,** executive vice president and secretary; **Harvey W. Purdy,** assistant secretary; **Samuel D. Harrison,** assistant treasurer; **Alfred W. Kath,** director of engineering; **Nelson Carman,** director of sales. Mr. Snyder is board chairman and vice president.

Tinkham Veale, II, has been appointed assistant to the president of **The Ohio Crankshaft Co.,** it is announced by W. C. Dunn, president. Mr. Veale has been with the company since 1942 as manufacturing and administrative head of the Tocco division.

Hugo W. Jones has been appointed assistant sales manager of **Adamas Carbide Corp.,** Harrison, N. J. In his new position, Mr. Jones will handle representative and distributor relations for Adamas.

David P. Reynolds, vice president and sales manager of **Reynolds Metals Co.,** Louisville, Ky., announces the purchase by his company of a government-owned aluminum extrusion plant at Grand Rapids, Mich. The plant, which was built during World War II, is designed for the production of high strength aluminum rod, bar, shapes and tubing, and has a rated annual capacity of 10,800,000 lb of aluminum.

Four summer sales conferences, designed expressly as refresher courses in sales engineering for the machine tool industry, are announced by **L. D. McDonald,** president of the **National Machine Tool Builders Association.** The conferences, each lasting five-and-a-half days, will be held at Cornell, Western Reserve, Dartmouth and Purdue, and will begin July 11.

Irving S. Levinson has joined **Ampco Metal, Inc.,** of Milwaukee, as manager of the process industries. His duties will include supervision of all operations pertaining to the process industries.

Arthur B. Cooper has been named assistant to the vice president, operations, in a series of promotions announced by **Jessop Steel Co.,** Washington, Pa. **Edwin C. Thomas, Jr.,** was made general superintendent; **Benjamin H. Brown** was named superintendent of the electric furnace department; and **Joseph W. Stier** becomes superintendent of scheduling.

M. L. Bricker, Ford Motor Co. vice president, has relinquished his duties as head of the general production division and will act as a consultant on special projects and problems, it has been announced. Mr. Bricker will continue as

KEMPSMITH
LH MILLER...
IDEAL FOR THAT "IN BETWEEN" MILLING JOB

Yes — It's a light, horizontal milling machine — but RUGGED and DEPENDABLE like all Kempsmith Millers. Designed primarily to bridge the gap between low range hand millers and big, expensive machines, the LH MILLER combines simple, sound and rigid construction with flexibility and versatility — ideal for small end milling, high speed jig boring, keywaying, oil grooving, light straddle milling, etc.

CUTS COSTS IN 3 WAYS — (1) Lowest initial investment and maintenance cost (2) Lowest possible setting up and tearing down time (3) Lowest power consumption. In addition, you are assured of the highest degree of accuracy and rigidity.

Write for Bulletin No. 127

THE KEMPSMITH MACHINE CO., 1847 SOUTH 71st STREET, MILWAUKEE 14, WIS., U. S. A.

KEMPSMITH

• *Precision Built Milling Machines Since 1888* •

a director, vice president and member of the Policy committee.

Standard Reamer and Tool Co. announces a change of name to **Special Tool and Cutter Co.**, and a transfer of location to 401 Salliotte St., Ecorse, Mich.

Paul J. Welsh has joined the research staff of **E. F. Houghton & Co.**, Philadelphia, it has been announced. Mr. Welsh, a graduate of Carnegie Institute of Technology, was formerly on the development staff of B. F. Goodrich Co.

J. H. Denton has been named manager of sales administration of **The Carborundum Co.**, it has been announced. He replaces **D. S. Masson**, who recently became assistant to the district manager in Detroit.

Frank T. Sisco, director of Alloys of Iron Research, has been appointed technical director of the **Engineering Foundation**, it has been announced. The foundation, sponsored by the ASCE, AIME, ASME and AIEE, supports fundamental research in all fields of engineering.

William C. Jordan, vice president and general manager of **Wright Aeronautical Corp.**, was recently elected president and director of this subsidiary and its parent company, **Curtiss-Wright Corp.** At the same time **Guy W. Vaughan**, president of Curtiss-Wright and Wright Aeronautical, was elected board chairman of Curtiss-Wright Corp.

Richard A. Heald, formerly treasurer of **The Heald Machine Co.**, Worcester, Mass., was elected president of the company at the annual meeting held recently. He succeeds his brother, Roger N., who became board chairman.

The Bullard Co., Bridgeport, Conn., has acquired the business and products of the **Universal Boring Machine Co.**, of Hudson, Mass. Manufacture of the horizontal boring mills will be continued at the Bullard plant.

Arthur C. Heller has been elected president of **Heller Bros. Co.**, manufacturers of tool steel and hand tools. At the same time, **James G. Henry, Jr.**, was elected vice president and secretary; **Lawrence B. Heller**, assistant secretary; and **Anna W. Ibach**, treasurer.

Frederick S. Bartlett has been appointed factory manager of the Bristol, R. I., plant of **United States Rubber Co.**, it has been announced. Mr. Bartlett has been associated with the plant for 23 years.

The first successful applicant, **David A. Dixon**, of Racine, has recently been selected to receive the **George Gorton** scholarship in mechanical engineering. The scholarship, set up by Mr. Gorton in 1948, provides for a four-year term at a school selected by the applicant, in addition to personal assistance by Mr. Gorton, and added training at George Gorton Machine Co.

Chester D. Jones, Jr., has been named purchasing agent of **Diamond Alkali Co.**, Cleveland, it was announced by W. E. Bittner, director of purchases. Mr. Jones returns to the main office from Texas, where he served as plant purchasing agent. Also promoted were **W. C. Logan** and **W. C. Mahan**, named assistant purchasing agents; and **P. P. Eppinger**, who succeeds Mr. Jones at the Texas plant.

Revere Copper and Brass, Inc., formally opened a new plant, comprising 13½ acres, in Los Angeles on Apr. 19. In addition to a rod and tube mill, the plant will house the general offices of Revere's Pacific Coast division.

At the recent opening of **Eutectic Welding Alloys Corporation's** Flushing, N. Y., plant, "CutTrode", the company's cutting electrode was used to cut apart a steel ribbon during the ceremonies. The Flushing plant will add about 100,000 sq ft to Eutectic's operations, and plans are underway for additional buildings.

OBITUARIES

Benjamin F. Waterman, veteran employe of the **Brown & Sharpe Mfg. Co.** for over fifty years, died recently. Mr. Waterman entered the company as an apprentice in 1895 and rose to become head of the mechanical planning department.

They Like **MANHATTAN CUT-OFF WHEELS**
at Empire Steel Castings
Faster Cutting . . . More Cuts per Wheel

That's the story of Manhattan Cut-Off Wheels on this Tabor machine in the plant of the Empire Steel Castings Co. at Temple, Pa. The operator photographed above is cutting off riser and gate on a high alloy stainless steel casting for a pressure valve insert. 16" x ⅛" Manhattan Cut-Off Wheels give most satisfactory service, according to Empire cleaning shop foreman. "In fact, they wear down so evenly, we are able to use them in their reduced size for a lot of little grinding jobs around here."

Developments in both rubber and resinoid bonds have greatly increased the number of cuts per wheel, and improved the quality of cut. Manhattan Cut-Off Wheels are "pay-off" wheels. Be sure to try Manhattans in your foundry and prove them for yourself.

ABRASIVE WHEEL DEPARTMENT

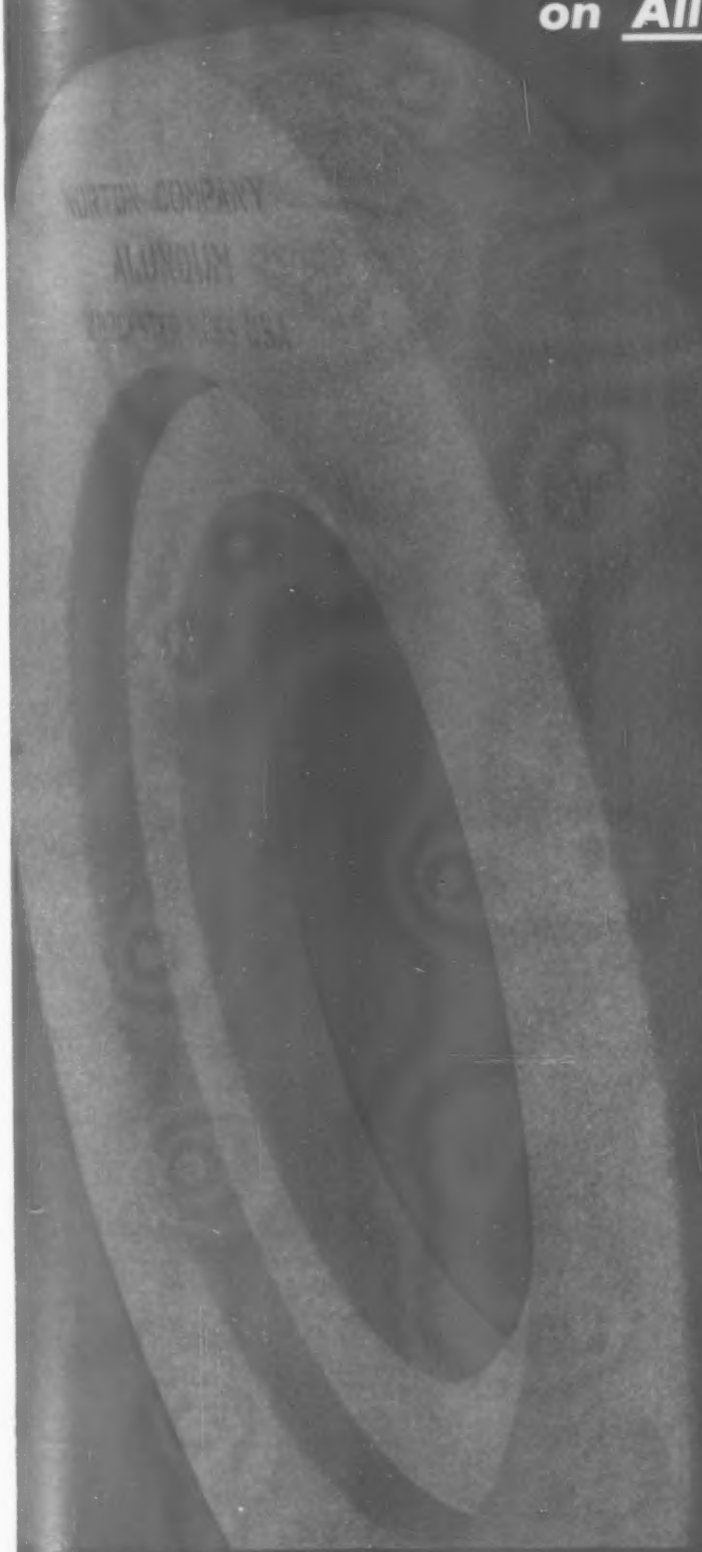
RAYBESTOS-MANHATTAN INC.

MECHANICAL RUBBER PRODUCTS — RUBBER COVERED EQUIPMENT — FRICTION MATERIAL — ASBESTOS TEXTILES
PACKINGS — POWDERED METAL PRODUCTS — ABRASIVE & DIAMOND WHEELS — BOWLING BALLS

MANHATTAN RUBBER DIVISION PASSAIC, NEW JERSEY

Looking for Lower Cost Cylindrical Grinding?

Then Put These NORTON ABRASIVES to Work on All Your Cylindrical Jobs



57 ALUNDUM
abrasive with its combination of sharpness and toughness is first choice for a large number of the cylindrical jobs on steel.

32 ALUNDUM
abrasive with its extra sharpness and coolness of cut is especially effective on many parts made of hardened steel.

ALUNDUM
abrasive (regular) has a toughness that makes it especially suitable for heavy stock removal, severe sharp corner work and high production jobs.

CRYSTOLON
abrasive has the combination of hardness and sharpness necessary for cast iron and the nonferrous metals.

Let a Norton abrasive engineer or a factory-trained Norton distributor man study all of your cylindrical grinding jobs and make a cost-cutting specification for each one. *Low grinding costs are mighty essential now.*

NORTON ABRASIVES®

NORTON COMPANY, WORCESTER 6, MASS. · Warehouses in Five Cities · Distributors in All Principal Cities

Use This for More Information on Tools of Today

For your convenience a key number follows the announcement of each product reviewed in the *Tools of Today* section. To obtain complete information, circle the corresponding numbers on this coupon, and mail the coupon to THE TOOL ENGINEER.

Tools of Today Department, THE TOOL ENGINEER, 550 West Lafayette Blvd., Detroit 26, Michigan

Gentlemen:

Please send me further information on the Tools of Today items checked below:

T-5-1	T-5-2	T-5-3	T-5-4	T-5-5	T-5-6	T-5-7	T-5-8	T-5-9	T-5-10	T-5-11
T-5-12	T-5-13	T-5-14	T-5-15	T-5-16	T-5-17	T-5-18	T-5-19	T-5-20	T-5-21	T-5-22
T-5-23	T-5-24	T-5-25	T-5-26	T-5-27	T-5-28	T-5-29	T-5-30	T-5-31	T-5-32	T-5-33
T-5-34	T-5-35	T-5-36	T-5-37							

Name ..... Position .....

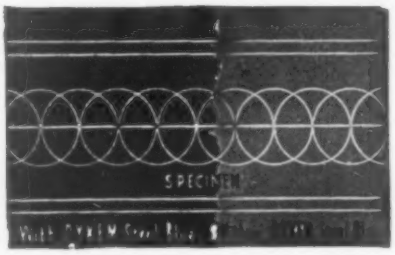
Firm .....

Street ..... City, State .....

DYKEM STEEL BLUE

STOPS LOSSES

making dies & templates



Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

THE DYKEM COMPANY, 2303D North 11th St., St. Louis 6, Mo.
In Canada: 2466 Dundas St. West, Toronto, Ont.

have we your right address?

if you've moved, notify ASTE headquarters of your new address so that THE TOOL ENGINEER and other society information will reach you promptly. Write your NEW and OLD address on a penny postcard and mail to:

American Society of Tool Engineers
10700 Puritan Ave., Detroit 21, Michigan

Use AIR *that's* LUBRICATED!

STOPS WEAR—Here's how to make cylinders, tools, and other air operated equipment work better and last longer. Use this new Hannifin "Air Warden" Unit! Adds atomized oil to air stream. Ends worry about lubrication of inaccessible parts.

GUARDS AGAINST RUST—Leaves film of oil covering all internal surfaces to protect against rust when equipment is shut down and idle.

SAVES TIME—Works automatically. Minimizes manual maintenance requirements. Oil supply always visible through transparent bowl. Positive shut off for filling without interrupting air flow.

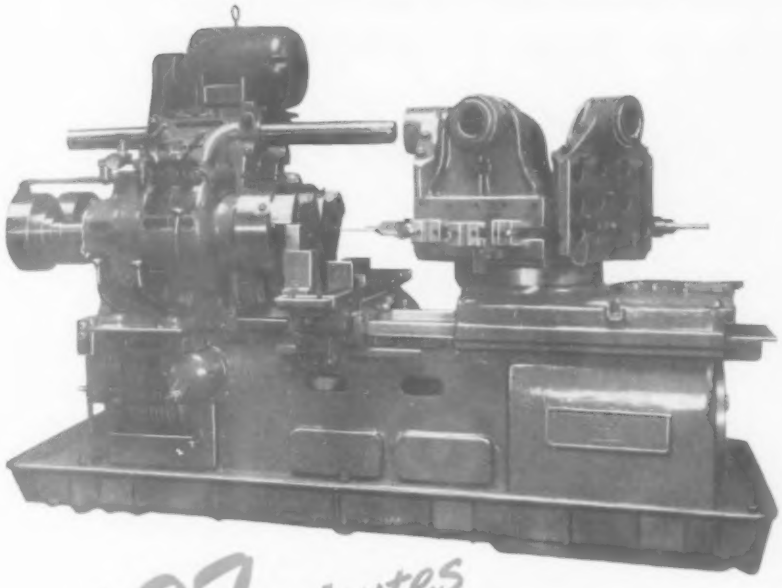
ECONOMICAL—Provides effective lubrication without waste. Uses oil only when air flows. Feed rate accurately controlled, visible, and fully adjustable. ⅜" and ½" sizes. *Send for information about Hannifin "Air Warden" equipment.*

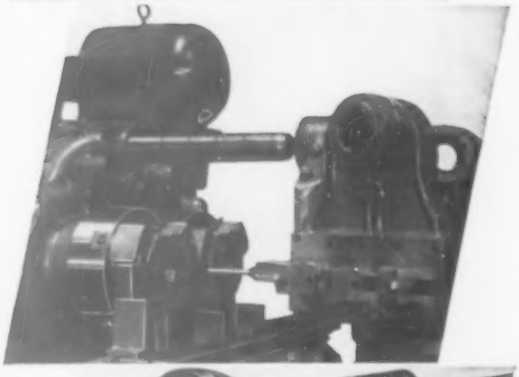
The "Air Warden" Line

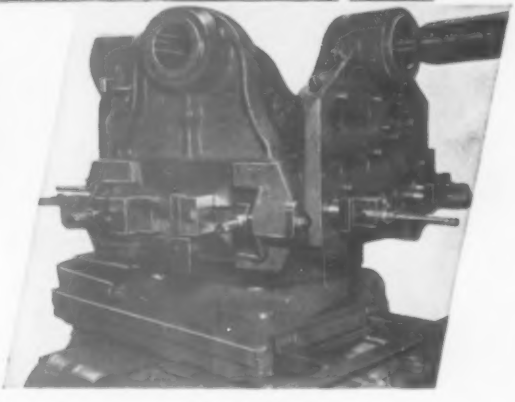
HANNIFIN CORPORATION

1101 So. Kilbourn Ave. • Chicago 24, Illinois

2 at a time
$AVES TIME







4.37 minutes on the
P&J 5D2-15 AUTOMATIC

Responsibility for performance of this calibre rests with P&J tooling experts. They know how to engineer the tooling to produce duplicate parts in minimum time, accuracy considered.

In this case there are fifteen operations on each of two pieces in the remarkable floor-to-floor time of 4.37 minutes. This gives you an idea what the P&J 2-spindle Automatic — with turrets and slides tooled the P&J way — can do for you. Send us your prints or parts for estimates.

SEQUENCE OF OPERATIONS
AS TOOLED BY POTTER & JOHNSTON

1st TF — Rough bore three diameters. Face shoulder.

2nd TF — Rough face front side, divided cut.

3rd TF — Finish bore three diameters. Form bevel. Machine 3.009" diameter.

4th TF — Finish face front side. Machine groove in bore.

5th TF — Ream three diameters.

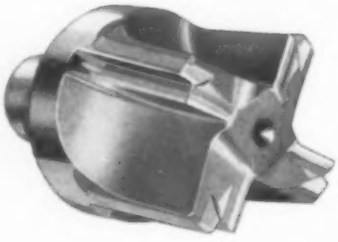
Potter & Johnston Company
Pawtucket, R. I.
subsidiary of Pratt & Whitney
Division Niles-Bement-Pond Company

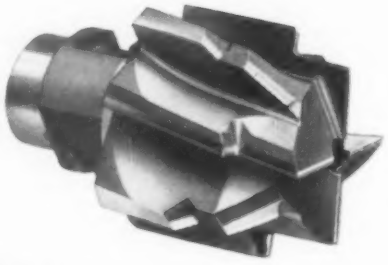
P&J

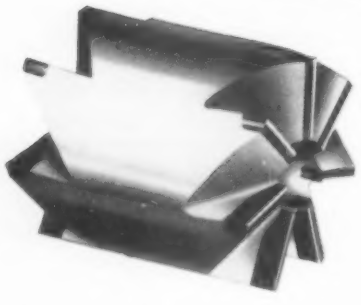
AUTOMATIC TURRET LATHES

"ECLIPSE QUALITY"

WHAT IT MEANS IN TERMS OF EFFICIENCY AND PROFIT for You!







1. DESIGN SERVICE. Eclipse engineers will design your cutters directly from part print. Your engineers will have more time to devote to other tool problems.

2. MAXIMUM LIFE. Eclipse engineering with 35 years experience behind it, assures cutter designs to give maximum life with minimum down time.

3. MULTIPLE OPERATIONS. Eclipse originated and developed multi-diameter cutters and its engineers are best qualified to design cutters to perform maximum operations at a single pass.

4. ASSURED QUALITY. Produced in the modern Eclipse plant with latest type equipment where quality is paramount and inspection rigid.

CUTTERS: H.S.S. and Tungsten Carbide Tipped—Multi-diameter—Inserted Blade—Center Cutting—Inverted and Down Drive—Double End Facers—End-Form—two piece Core Drills.

HOLDERS: Stop Collar—Bushing Guided—Adjustable length—Floating—Specials of all kinds.

Also complete stock of Standard Holders, Cutters and Pilots.

ECLIPSE COUNTERBORE CO.

Founded over thirty five years ago

DETROIT 20, MICHIGAN

THIS WIDE RANGE OF PUMPS MAKES SELECTION EASIER

COOLANT PUMPS
Centrifugal
Geared

LUBRICATING PUMPS
Geared
Vane

HYDRAULIC PUMPS
Geared

MISC. MACHINE PUMPS
Centrifugal
Geared
Vane

DIRECT DRIVE OR MOTOR DRIVEN

The wide variety of types and sizes available in Brown & Sharpe Pumps simplifies your selection of the right pump for the job.

Every pump in this line has distinctive features to assure economical, dependable long-life service. All have the same familiar standards of high quality that characterize Brown & Sharpe machine and tool equipment.

Make your selection with the help of our latest pump catalog. It includes illustrations, complete descriptions, installation dimensions and charts showing performance characteristics. Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.

We urge buying through the Distributor

BROWN & SHARPE PUMPS B·S

GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

GEAR INSPECTION that accepts broad-shouldered responsibility

Recorded charts of each gear inspection operation, automatically produced by these Inspection Instruments, are the fundamental safeguard. The vagaries of the human element are minimized to the "Nth" degree. The charts are permanent and can be filed for future reference.

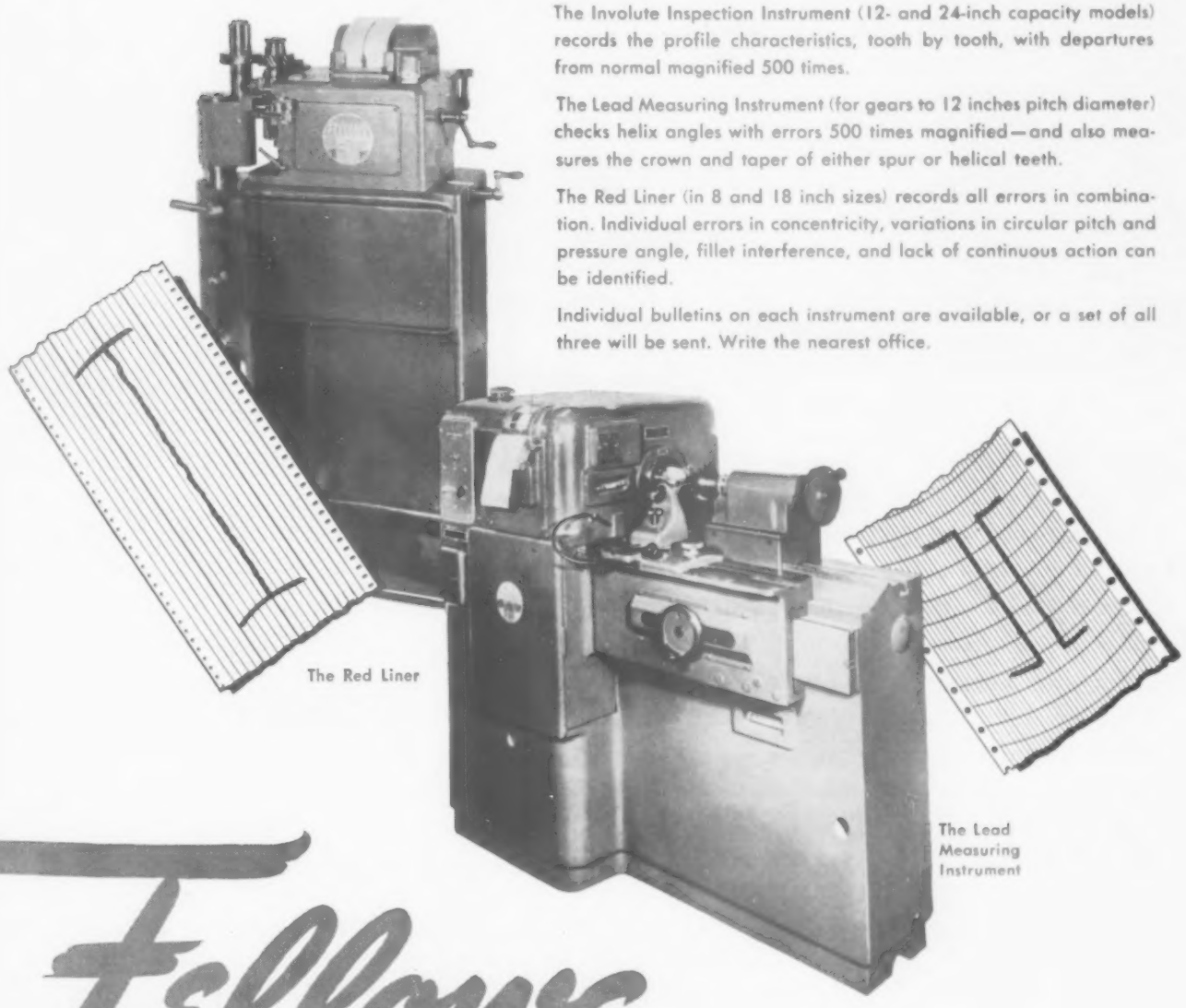
The operating accuracy of each of the Instruments is a known quantity; checked and rechecked at any time by reference to a master gauge or gear, which is part of the regular equipment. While the inspection of external gears is pictured here, standard equipment provides for checking internal gears as well.

The Involute Inspection Instrument (12- and 24-inch capacity models) records the profile characteristics, tooth by tooth, with departures from normal magnified 500 times.

The Lead Measuring Instrument (for gears to 12 inches pitch diameter) checks helix angles with errors 500 times magnified—and also measures the crown and taper of either spur or helical teeth.

The Red Liner (in 8 and 18 inch sizes) records all errors in combination. Individual errors in concentricity, variations in circular pitch and pressure angle, fillet interference, and lack of continuous action can be identified.

Individual bulletins on each instrument are available, or a set of all three will be sent. Write the nearest office.



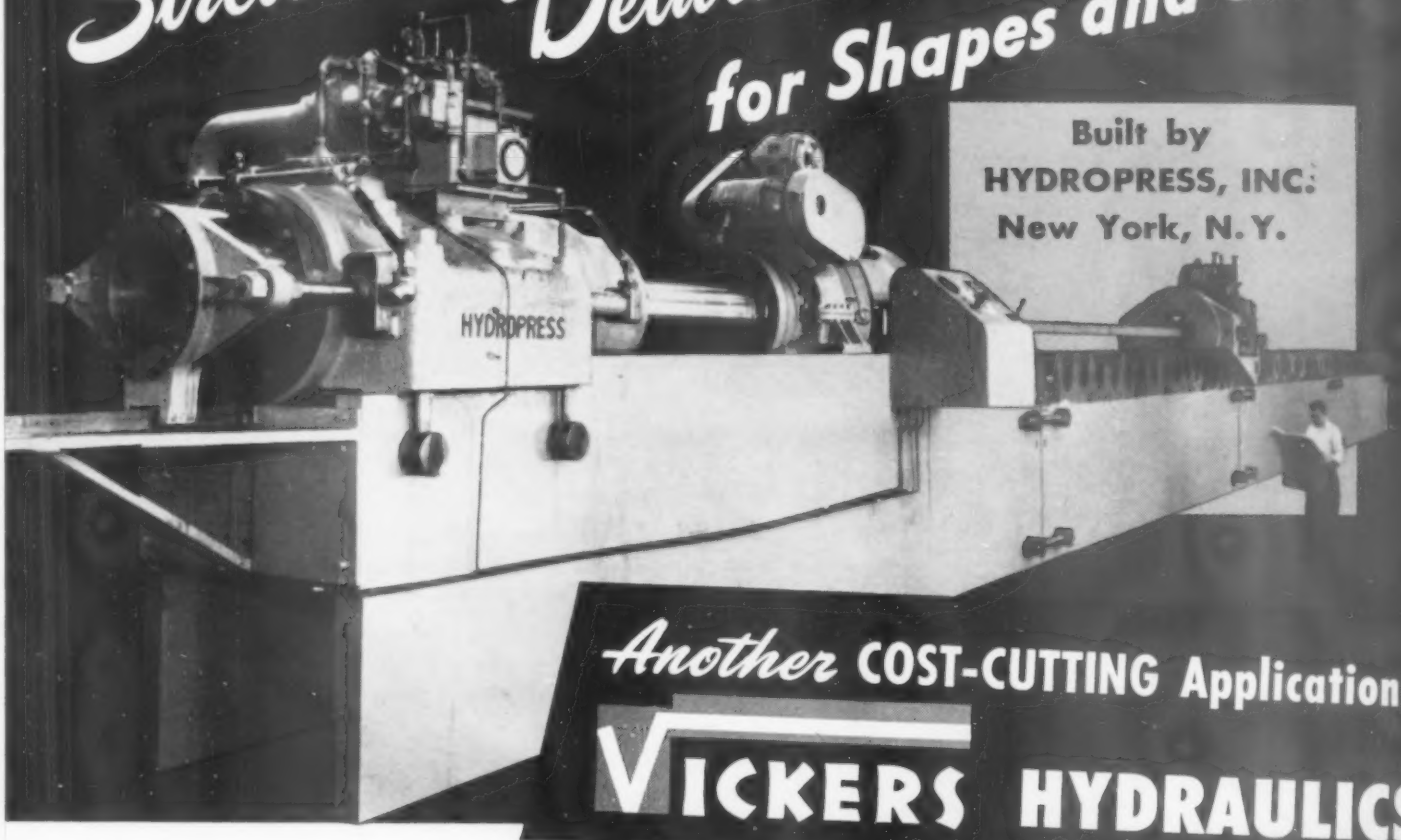
The Red Liner

The Lead Measuring Instrument

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont.
Branch Offices: 616 Fisher Bldg., Detroit 2 • 640 West Town Office Bldg., Chicago 12 • 7706 Empire State Bldg., New York I.

Stretch-Straightening-Detwisting Machine for Shapes and Sections



Built by HYDROPRESS, INC. New York, N. Y.

Another COST-CUTTING Application of VICKERS HYDRAULICS

Powered by Vickers Hydraulic Power Units and controlled by Vickers Hydraulic Valves, this huge machine performs detwisting and straightening operations on structural members as long as 40 feet and with cross-section lying within a 14 inch diameter circle. The stretch-straightening and detwisting operations are performed simultaneously so that torsion is applied while the section is under tension and ready to flow. The torsional and tensional stresses are sufficient to obtain immediate flow and permanent detwisting of the material with a minimum of spring back that would occur to a great extent if torsion were applied alone.

An important feature of the machine is the arrangement of movable heads that makes it possible to detwist any part of the member if localized detwisting is necessary.

This is another of the innumerable jobs throughout industry that is being done better, faster and at less cost with the help of Vickers Hydraulic Controls. Consult the Vickers office near you for information on how Vickers Hydraulic Equipment can improve your machinery.

VICKERS Incorporated • 1416 OAKMAN BLVD. • DETROIT 32, MICHIGAN

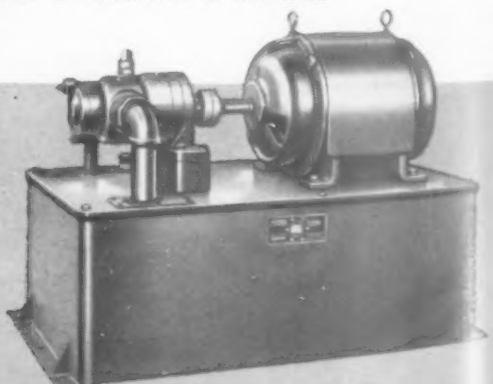
DIVISION OF THE SPERRY CORPORATION

Application Engineering Offices: ATLANTA • CHICAGO • CINCINNATI • CLEVELAND • DETROIT • LOS ANGELES • NEWARK • PHILADELPHIA PITTSBURGH • ROCHESTER • ROCKFORD • ST. LOUIS • SEATTLE • TULSA • WASHINGTON • WORCESTER

3814

VICKERS HYDRAULIC POWER UNIT

A compact hydraulic power package that simplifies hydraulic system design and reduces costs. Available with various pump combinations to meet wide range of requirements up to pressure demands of 2000 psi. There are 92 standard sizes and types of single stage, two stage and dual pressure pumps equipped with motors from ¾ to 20 hp. Ask for Bulletin 46-43.



Here's a Proved Short-Cut to Savings

5 Kennamatic tools in action, roughing a forged steel stem pinion, SAE 5140. Speed is 230 SFM, feed .027", depth of cut 3/16" . . . and the Kennamatic tools turn out 350 pieces per index, 56,000 pieces per tool!

When the going gets tough . . . . Kennametal Tooling is the sure way to faster production at less cost

Another typical example of time-saving Kennamatic tooling. This cast iron valve body is turned at 250 SFM, with a feed of .005", depth of cut from 1/8" to 3/16". On this job other brazed tools had to be changed 8 times per shift . . . whereas Kennamatic inserts are simply indexed twice per shift, and give four days' service before resharpening.

Why wait for the going to get tough?

Under the pressure of rising costs—it becomes "tougher" and "tougher" to produce at a profit, and sell at a price.

But remember that "tough" is a relative term—any job is tough if there's an easier, faster, less expensive way to do it.

Your machining operations are tough, slow, and expensive . . . unless you are using uniformly strong, hard, long-lived Kennametal coupled with the latest Kennametal improvements in carbide tool design.

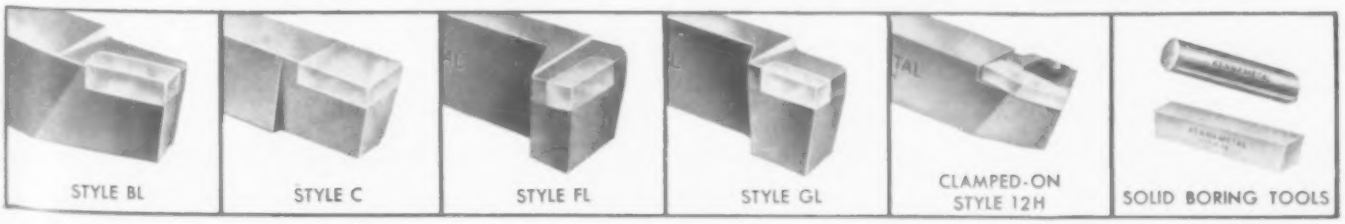
Kennametal tooling keeps your machines on the job with minimum interruption—enabling you to turn out from 2 to 5 times more than steel tools on the same machine in the same time, with from 5 to 20 times longer tool life.

Use this modern tooling technique to save money in your plant—ask our district tool engineer to demonstrate.

Write for new Catalog

KENNAMETAL *Inc.* **Latrobe, Pa.**

MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES AND CUTTING TOOLS THAT INCREASE PRODUCTION



This better way of Contour Finishing

. . . another case of BEHR-MANNING PIONEERING with METALITE® BELTS

A flexible abrasive belt and a contact wheel formed to fit the work — this was the successful answer by Behr-Manning engineers to the growing demand for higher production, better finish, and greater economies in a wide variety of contour grinding jobs.

The wrench finishing method illustrated is a case in point. Faster, because of the sharper, factory-coated belt. Better finish, because of the grit uniformity of the METALITE belt, and the uniform pressure of the formed contact wheel. Greater economies because operators produce more pieces per hour — and because you save the cost of replacing set-up wheels.

Behr-Manning Application Engineers, in laboratories fully equipped and strategically located, are constantly solving new grinding problems. Bring yours to them. Write us to put you in touch.

Long belts for cooler cutting. This set-up was devised by Behr-Manning Application Engineers.

Grinding an inside curve is easy with a contact wheel formed to do it.

The concave surface on this contact wheel fits the job perfectly.

BEHR-MANNING

BEHR-MANNING • TROY, N.Y.

NORTON abrasives

ALSO QUALITY OILSTONES FOR INDUSTRIAL NEEDS

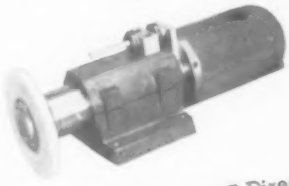
Put These POPE PRECISION SPINDLES To Profitable Use

Your grinders and other machine tools will do more and better work when they are equipped with these skilfully designed, precision made, *sealed package* Spindles.

P-32T—This POPE Sealed Motorized Spindle is recommended for all makes of 6" x 18" surface grinders. It has sealed-in 1 HP motor and sealed lubrication, SKF super-precision, double row roller bearings. It assures finer finishes and greater production.

P-2514—This POPE Motorized Spindle with sealed lubrication is recommended for a broad range of grinding, milling and boring applications. It runs in any position from horizontal to vertical. It comes in sizes from ¾ to 20 HP, 900 to 3600 RPM.

P-1—This POPE Belt-driven, Cartridge Type Surface Grinder Spindle with sealed-in lubrication fits standard grinders. It operates at speeds up to 6000 RPM. It gives long, dependable service.



P-2652—This POPE Direct Motorized Cartridge Type Spindle with 1 HP, 3450 RPM totally enclosed motor is equipped with mounting bracket with provision for 3" of precise endwise adjustment.

P-274—This POPE Double-Ended Tool and Cutter Grinder Spindle with sealed lubrication employs twin belt pulley center drive at speeds up to 6000 RPM. Fits standard grinders.

P-3521—This POPE Internal Grinding Spindle is adapted to mount Jarno taper interchangeable extension arbors to cover a broad range of service. The 1" series shown on page 3 of Data Sheet No. 7 will fit this spindle.

For complete specifications and estimates on any or all of these Spindles get in touch with

No. 60

POPE

TRADE MARK REG. U.S. PAT. OFF.

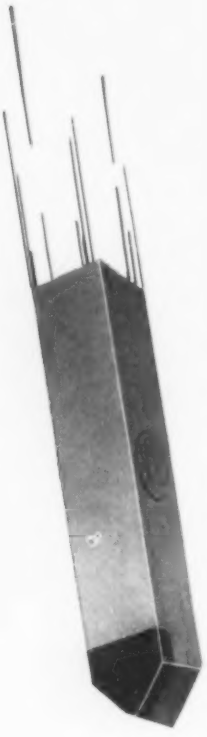
POPE MACHINERY CORPORATION

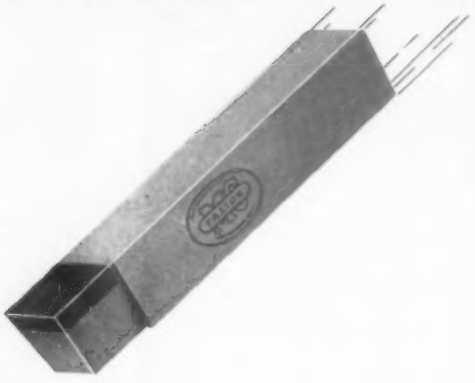
ESTABLISHED 1920

261 RIVER STREET • HAVERHILL, MASSACHUSETTS

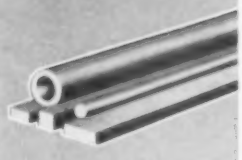
BUILDERS OF PRECISION SPINDLES

Talide
(TUNGSTEN CARBIDE)
Cutting Tools





TALIDE METAL MEETS EVERY REQUIREMENT



SOLID BAR STOCK

DRAWING DIES

CENTERLESS BLADES

DRILL JIG BUSHINGS

ROLLING MILL WORK ROLLS

2 to 3 TIMES FASTER!

Call our service engineers for assistance on tooling problems

Faster cutting than other tools, Talide Tools and Tips wear much longer and require only infrequent redressings. Same long-run advantages whether you machine steel, cast iron, non-ferrous metal or non-metallic materials.

The quality of Talide Tools never varies. Made from the hardest man-made metal, each Talide Tool and Tip has the same metallurgical consistency.

For lower costs, try Talide Tools and Tips . . . plastic-dipped for protection in shipment or storage. Available in 24 hours or less from warehouses in Newark, Youngstown, Detroit and Chicago.

Send for engineering-style catalog 48-T "Standard Talide Tools and Tips"

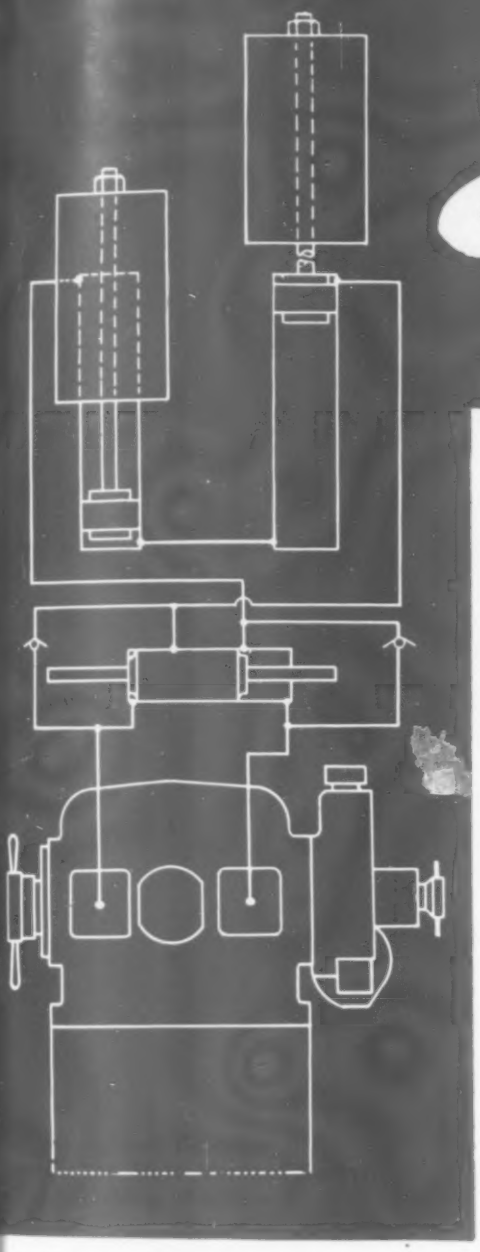
SINTERED CARBIDES
METAL CARBIDES CORPORATION
MC TALIDE
YOUNGSTOWN, OHIO.
HOT PRESSED CARBIDES

METAL CARBIDES CORPORATION

YOUNGSTOWN 5, OHIO *Pioneers in Tungsten Carbide Metallurgy*

CUTTING TOOLS · DRAWING DIES · WEAR RESISTANT PARTS

SPECIAL features are *Standard*



A. Oilgear Two-Way Electro-Hydraulic Controlled Variable Delivery Pump.
B. Interlock Cylinder for Operating Shuttle Tables.
C. Left Hand Tool Slide Cylinder.
D. Right Hand Tool Slide Cylinder.

Oilgear Broaching Machines employ Oilgear Fluid Power Systems. These Systems provide as *standard* equipment: (1) important, exclusive, patented features that other systems do not offer; and (2) additional features available only at extra cost in other machines.

Important Features of Oilgear Broaching Machine Fluid Power Systems are:

1. Oilgear two-way reverse flow variable delivery pumps which provide higher cutting speeds as *STANDARD*.

2. Two-way reverse flow variable delivery pumps which enable you to independently adjust cutting and return speeds to the maximum permissible requirements of the job . . . and to the ability of the operator to serve the machine.

3. Exclusive patented electro-hydraulic two-way directional pump control which eliminates the usual conglomeration of separate valves and piping . . . and condenses all controls into a simple unit integral with the pump.

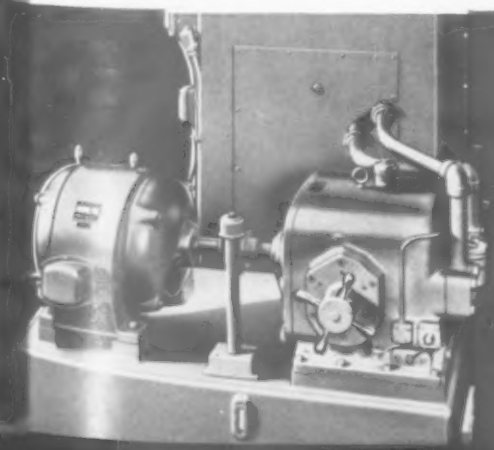
4. Positive broaching speed under load up to 150% overload.

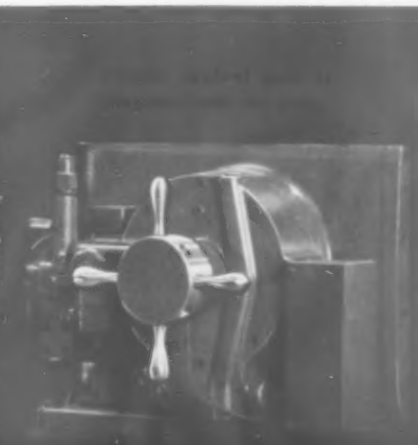
5. *Savings* in power because Oilgear *uses* power only in proportion to the speed and force required . . . because its regenerative circuits reclaim power on every return stroke . . . and because it employs *NO* speed, directional or other valves to waste power.

6. Simple systems which use less piping, require less space, employ smaller motors, operate efficiently with smaller fluid reservoirs, require less oil, promote good housekeeping.

7. Compact machine construction with all parts easily accessible for adjustment and servicing.

Oilgear Broaching Machines always have been and are today the most highly productive line of broaching machines. There is an Oilgear Machine for every broaching need and if you are not familiar with the entire line you are invited to send for bulletins. THE OILGEAR COMPANY, 1573 W. Pierce St., Milwaukee 4, Wisconsin.

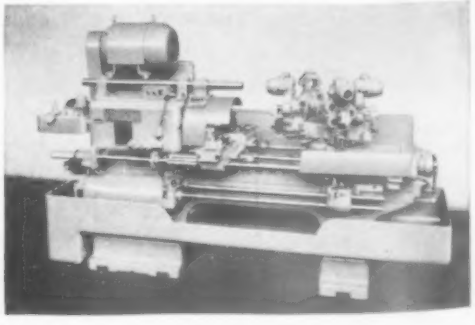




Oilgear
Fluid Power

GISHOLT
Fastermatics
(AUTOMATIC TURRET LATHES)

This simple control drum enables you to select the BEST feed for EACH cut because the Fastermatic provides infinite feed selection rather than limited and fixed gear ratios. Thus it makes feed selection efficient, quick and easy. Write for literature.



THE GISHOLT ROUND TABLE represents the collective experience of specialists in machining, surface-finishing and balancing of round or partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

Turret Lathes · Automatic Lathes · Superfinishers · Balancers · Special Machines

You get

NATION-WIDE ASSEMBLY SERVICE
+
HIGHLY CONTROLLED ACCURACY
+
COMPLETE INTERCHANGEABILITY

. . . when you specify

DANLY *Precision* Die Sets

Nation-wide die set assembly service, pioneered and perfected by Danly, is today a highly specialized business offering the stamping industry a fast, efficient means of obtaining deliveries on short notices. Because there are several Danly types and several thousand interchangeable combinations, a simple catalog selection is all that is usually required to suit specific needs.

The highly controlled accuracy of Danly Die Sets, with guide posts and bushings ground and lapped to close precision tolerances, assures top performance and long die life.

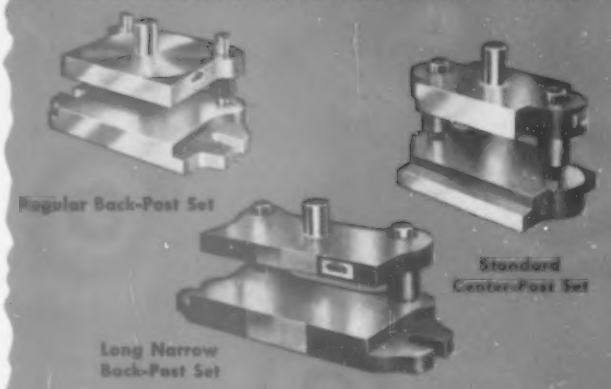
In addition, because designs and tolerances are standardized and maintained, you are assured of complete interchangeability. This is why so many plants have found it profitable to standardize on Danly Die Sets gaining flexibility of operation and worthwhile economy.

Use Danly's Special Machining Service and Save Time . . .

For special die sets, include any additional machining on your special die set order. Die wells, inserts, keyways and other operations will be performed to your specification.

Write for *free* bulletin and complete details

WIDE SELECTION OF STANDARD TYPES



Accuracy is rigidly controlled. Modern precision gauging methods are employed.

Stock and replacement problems are simplified when you standardize on Danly Precision Die Sets.

Call on the Danly Branch nearest you

These Danly branches are in position to give you efficient service. Assembly plants listed below (marked with stars) stock interchangeable parts for quick assembly and delivery of any standard die set to suit specifications.

- ★ **Chicago 50,** 2100 S. 52nd Ave.
- ★ **Cleveland 14,** 1550 E. 33rd St.
- ★ **Dayton 2,** 990 E. Monument Ave.
- ★ **Detroit 16,** 1549 Temple Ave.
- ★ **Grand Rapids,** 113 Michigan St., N.W.
- ★ **Long Island City 1,** 47-28 37th St.
- ★ **Los Angeles 54,** Ducommun Metals & Supply Co., 4890 S. Alameda
- ★ **Milwaukee 2,** 111 E. Wisconsin Ave.
- ★ **Philadelphia 44,** 18 W. Chelten Ave.
- ★ **Rochester 4,** 16 Commercial St.

DANLY MACHINE SPECIALTIES, INC.

2100 SOUTH 52nd AVENUE • CHICAGO 50, ILLINOIS

DANLY

25 YEARS OF DEPENDABLE SERVICE TO THE STAMPING INDUSTRY

PRECISION DIE SETS . . . STANDARD AND SPECIAL

"every job in the shop"

NON-SHRINKABLE

Specially annealed for easy machining ● Hardens with minimum distortion and size change ● Hardens without danger of cracking even in the most intricate designs

In addition to die steel uses such as blanking, forming and trimming, this versatile steel is good for taps, reamers, broaches, gauges, bushings, mandrels, rolls, cams, shears, lathe centers and many other jobs that tool rooms are called upon to supply in a hurry.

Of course you can't carry a supply of all the special tool steels that are designed to give maximum performance on each specific application (that's why we maintain warehouse stocks in principal manufacturing centers), but you *can* have a general purpose tool room stock and be sure it's a wise investment—just specify:

NON-SHRINKABLE

OTHER FIRST QUALITY Die Steels for Cold Work

CROCAR

OHIO DIE

AIR HARD

COLONIAL NO. 4

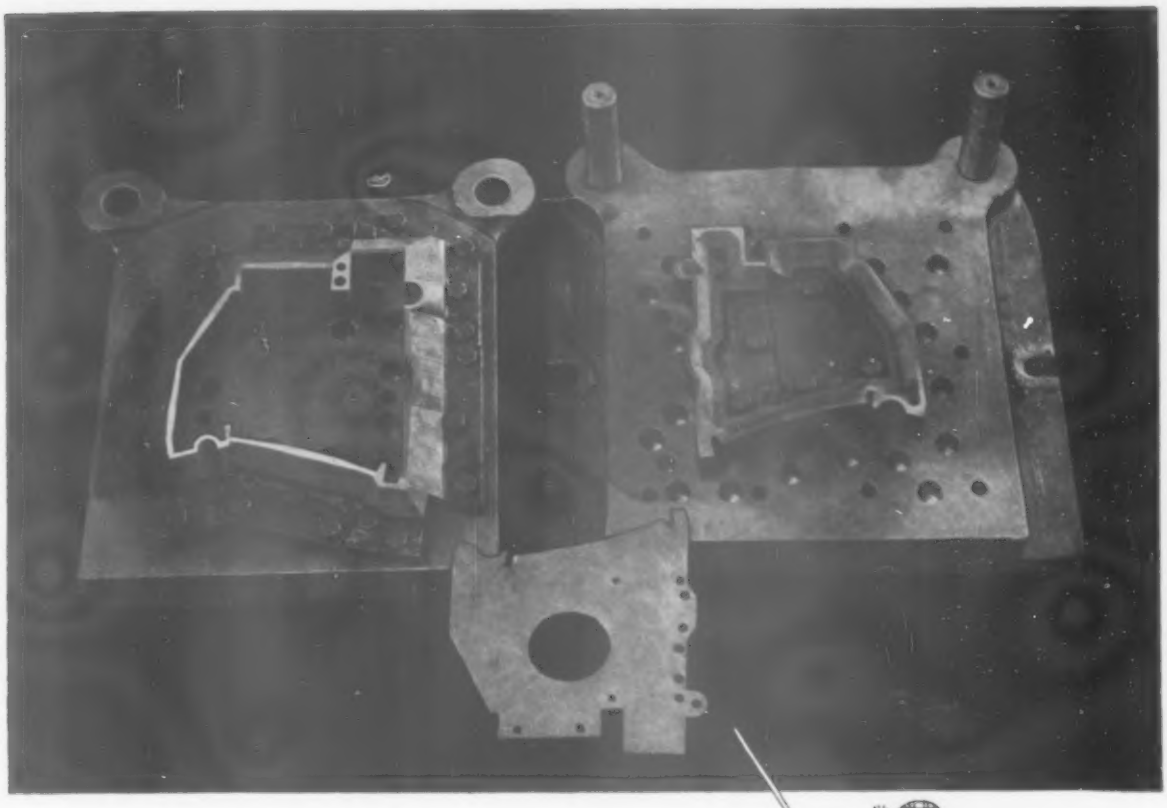
RED STAR TUNGSTEN

FIRST QUALITY TOOL STEELS

Vanadium-Alloys STEEL COMPANY

LATROBE, PENNA.

Colonial Steel Division Anchor Drawn Steel Co.



How to *Cut Costs and "Corners"* on Your Blanking Dies

Write for New Booklet:

COMPOSITE DIE SECTIONS

Contains complete data on 35 Standard Die Sections, from combinations of which thousands of die shapes can be made —also full information on Special Die Sections, and how to order.

Get Your Copy— Write for it Today

ADDRESS DEPT. TE-75

You can save steel and time in the making of dies for blanking, trimming, beading, or any application involving the cutting of sheet metals to regular or irregular shapes, by assembling them from FCC Composite Steel Die Sections.

These prefabricated die parts consist of fine tool steel cutting edges, in a selection of grades, electrically welded by a special process to non-hardenable mild steel bases. Thus, screw and dowel holes may be easily drilled after heat treating, and there are numerous other advantages that will be immediately obvious to the die maker.

Thousands of die shapes may be made up from combinations of thirty-five standard sections. Specially shaped sections are manufactured to customers' specifications in five to ten days.

● Make *your* dies this money-saving way—full data on request.

ALLEGHENY LUDLUM
STEEL CORPORATION
Pittsburgh, Pa.

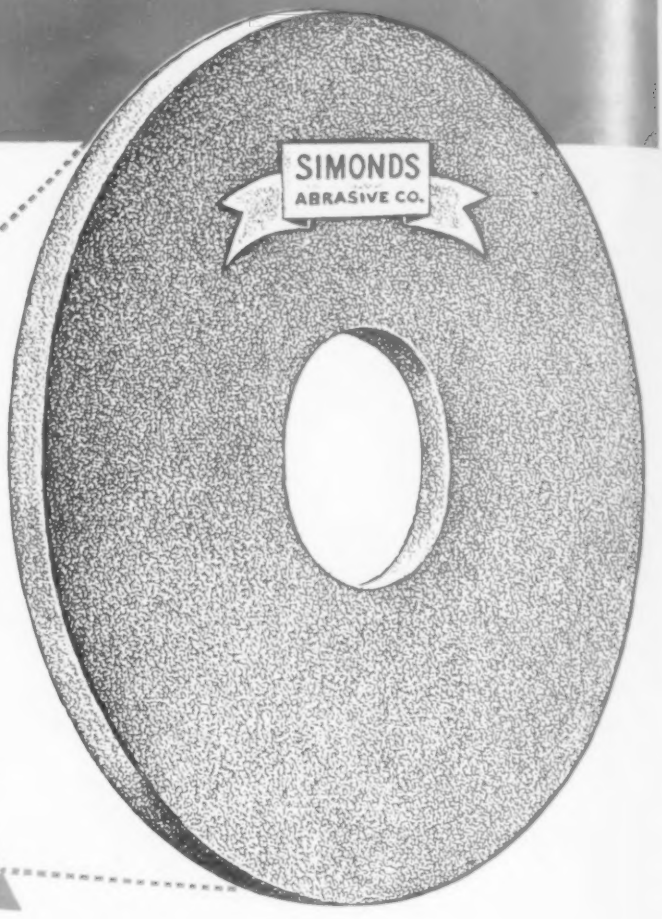
Forging and Casting Division

DETROIT 20, MICHIGAN

WAD 1694

SIMONDS
ABRASIVE CO.
PHILADELPHIA, PA.

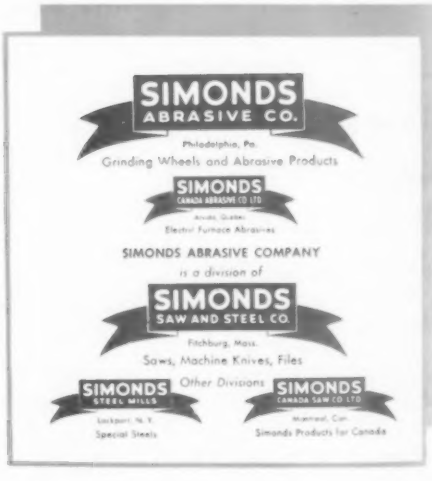
Grinding Wheels



Try this on your crankpin grinders

For superior grinding . . . quality finish . . . high production, use Simonds Abrasive wheels with the recently developed V-12 bond. Especially efficient for crankshaft grinding, these wheels cut fast, cool and hold a good radius for accurate work. In wide use by car builders, crankshaft manufacturers and the regrinding trade.

Free Data Book describes the complete Simonds Abrasive line. Let's send you a copy, together with name of your nearby Simonds Abrasive distributor.



SIMONDS ABRASIVE COMPANY, PHILADELPHIA 37, PA. DISTRIBUTORS IN PRINCIPAL CITIES

THE GREENFIELD STORY
of Service and Quality

"Acorn"

THE coming of mass production called for a new type of die which could be operated at high speed on machines. *The "Acorn" Die has proved to be the answer.*

The "Acorn" Die is simple in design. Shaped like an acorn, it is held in holders which fit any machine. A screw cap gives quick, accurate adjustment. The "Acorn" Die is today, as it has been since 1909, the most popular production die on the market. Through the years, "Greenfield" threading engineers have added several refinements of design, but the principle is still the same — a tool that has made a major contribution on production lines in war and in peace.

The complete story of the "Acorn" Die is yours for the asking. Just ask your local "Greenfield" Distributor, or write direct.

GTD

GREENFIELD TAP and DIE CORPORATION
Greenfield, Massachusetts

and

GEO MET RIC

THE GEOMETRIC TOOL CO.
New Haven 15, Connecticut

and

GTD AMPCO

AMPCO TWIST DRILL CORP.
Jackson, Michigan

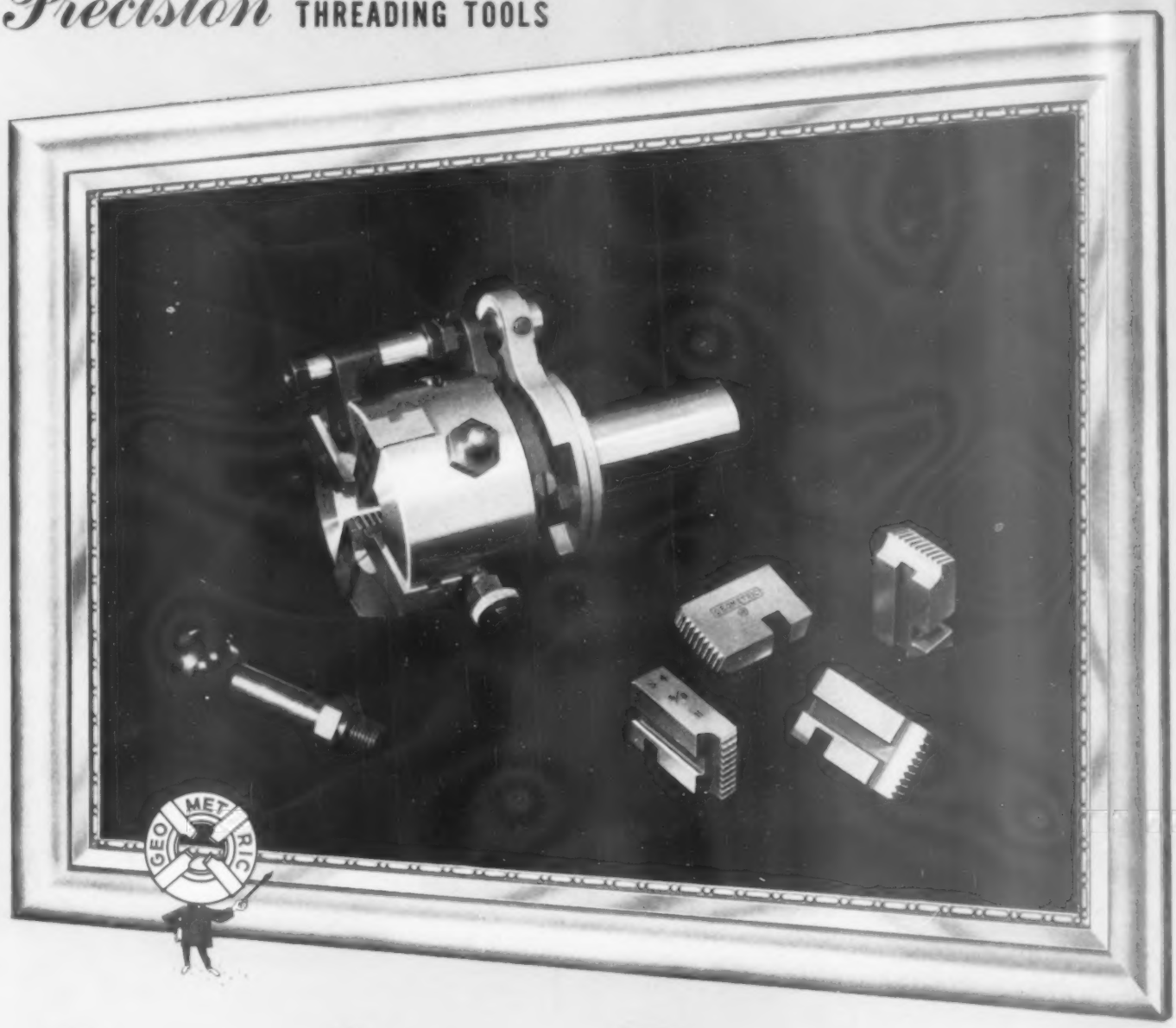
Divisions of Greenfield Tap and Die Corporation

GTD

GREENFIELD

Be Sure
Buy "Greenfield"

Precision THREADING TOOLS



New Aligning Shank

Style DS Die Head and Chasers

Quick adjustment to compensate for misalignment when threading . . . an optional feature that has been added to the Convertible DS Die Head.

★ ★

Available in 5/16", 9/16" and 3/4" sizes.

★ ★

GEOMETRIC also makes a complete line of Rotary and Stationary Self Opening . . . and Solid Adjustable Die Heads—Collapsing . . . and Solid Adjustable Taps—and GEOMETRIC Chasers.

"Be Sure . . . Buy Geometric"

THE

GEOMETRIC

TOOL COMPANY, NEW HAVEN 15, CONNECTICUT

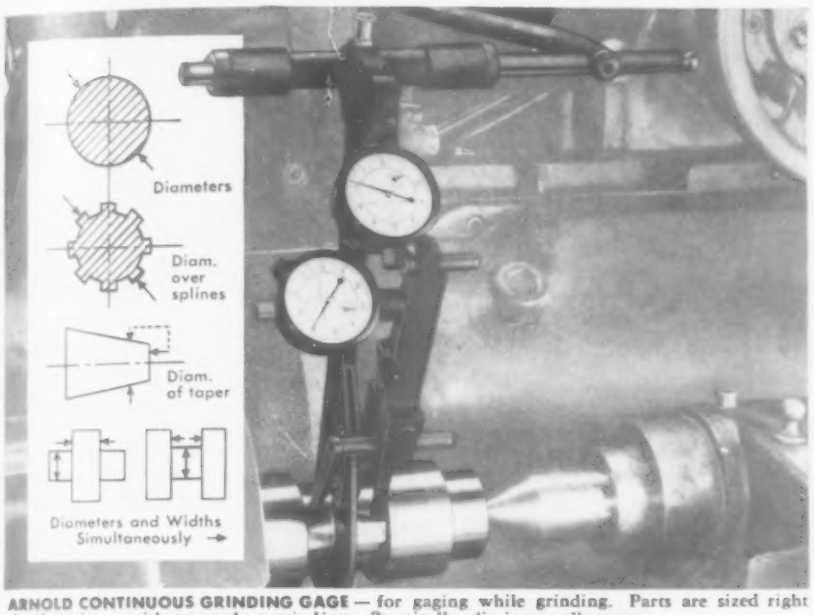
Division of Greenfield Tap and Die Corporation

GTD GREENFIELD TAP and DIE CORPORATION

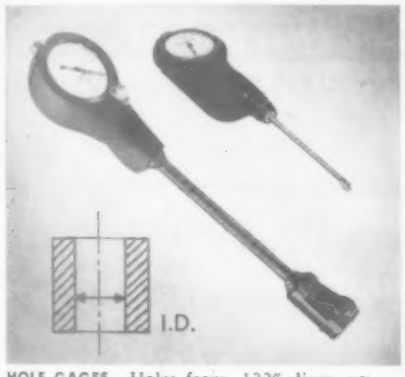
GTD AMPCO AMPCO TWIST DRILL CORPORATION

We're not using idle words when we say

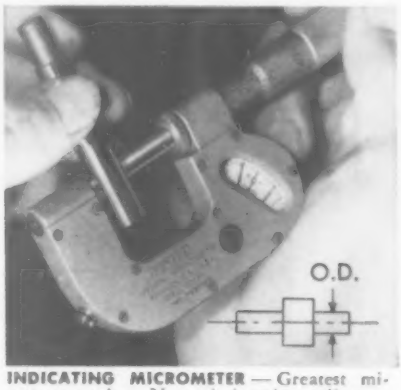
You can make it RIGHT the first time!



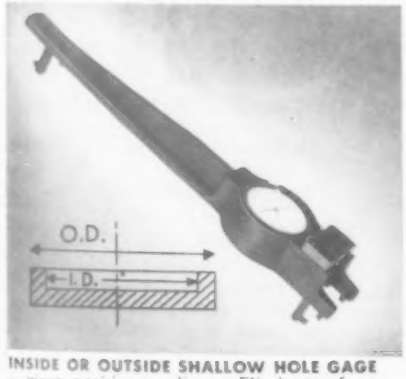
ARNOLD CONTINUOUS GRINDING GAGE — for gaging while grinding. Parts are sized right the first time—without costly regrinding. Practically eliminates all scrap.



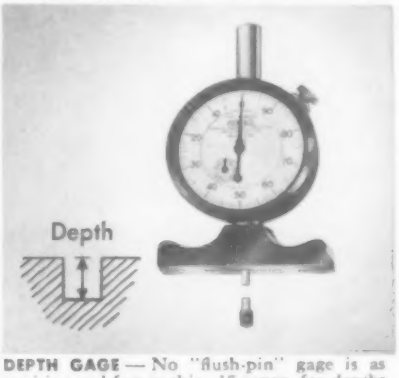
HOLE GAGES—Holes from .122" diam. up. Determine taper, out-of-round, irregularity, squareness, rifling, etc.



INDICATING MICROMETER — Greatest micrometer value. No variations in readings—constant anvil pressure. Tungsten carbide anvils; no-rust chrome finish.



INSIDE OR OUTSIDE SHALLOW HOLE GAGE —gives positive readings. Eliminates fumbling around: fast, self-locating, easy to use.



DEPTH GAGE — No "flush-pin" gage is as positive and fast as this. 1" range, for depths to 3" — greater if desired.

REDUCE SCRAP—

SAVE

at production
at inspection
at assembly

IMPROVE QUALITY
at lower cost

We know of reputable concerns that have turned out thousands of parts only later to find them wrong dimensionally. This *could have been avoided,* right at the machine, *before* a single dollar's worth of scrap was produced.

Think of the man-hours wasted working with old-type conventional gages that don't tell *which way* dimensions are going until it's too late. Think of the hours wasted in sorting and fitting. And, think of the loss in customer satisfaction and good will when products fail to live up to expectations—clearances too great or too little; ragged performance; noise; weak spots; breakdowns.

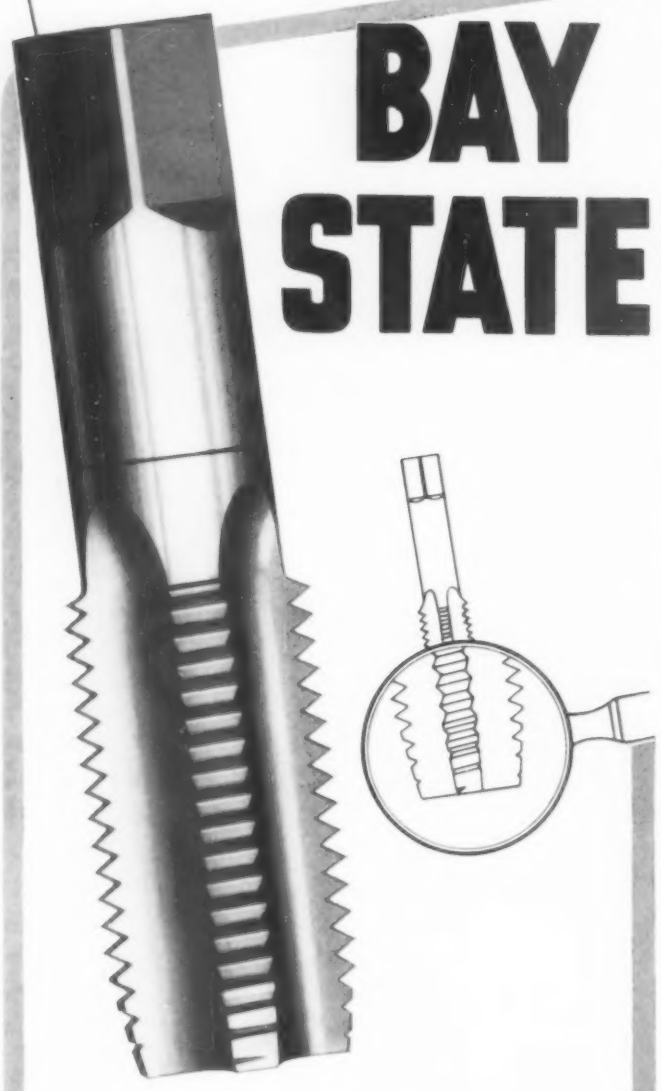
You *can* avoid all this. At the first operation, and through each subsequent operation, *visual* gage control—with gages like these—shows you how *far off* you are and *which way* you are going. Only a few of the hundreds of Federal *Indicating* Gages are shown here. Ask to see these or tell us what you want to gage and we'll show you how. Write gaging headquarters—Federal Products Corporation, 1104 Eddy St., Providence 1, R. I.

FEDERAL

PRECISION MEASURING INSTRUMENTS

DIAL INDICATORS • INDICATING GAGES • SPECIAL GAGES •
ELECTRONIC AND AUTOMATIC SORTING GAGES • AIR GAGES

A PLUG FOR BAY STATE



The chamfer of Bay State Taps, referred to in our factory as the "plug", is of exceptional accuracy and uniformity. Special machines of unusual design control this precision detail — another reason why Bay State Taps produce so many holes and still cut close to size.

On the Nearby Shelves of Your Industrial Supply Distributors

BAY STATE TAP & DIE CO.

MANSFIELD, MASSACHUSETTS

SET SCREWS MUST STAY PUT

TO MAKE SURE THEY DO

USE

UNBRAKO

Reg. U. S. Pat. Off.

Pat'd.

SELF LOCKERS!

No matter what the application, set screws must "stay put". To make sure they do, more and more designers and manufacturers are specifying our patented "UNBRAKO" Self-Lockers. They positively won't shake loose, no matter how chattering the vibration.

And remember, we can lock practically any set screw application, regardless of the type of point required. *Knurling does it*—ask us how!

These screws are not carried in stock. Prices on application.

Knurling of Socket Screws originated with "Unbrako" in 1934.

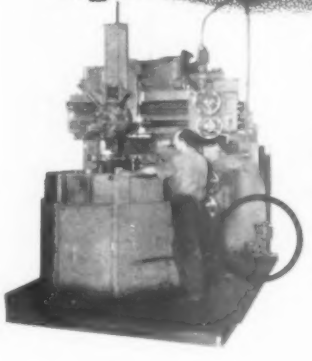
OVER 46 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PA., BOX 786

Chicago • Detroit • St. Louis • San Francisco

Prove for Yourself



The Superiority of RUTHMAN GUSHER COOLANT PUMPS

Master Vertical Turret Lathe equipped with Model TL7320 ½ HP Ruthman Gusher Coolant Pump

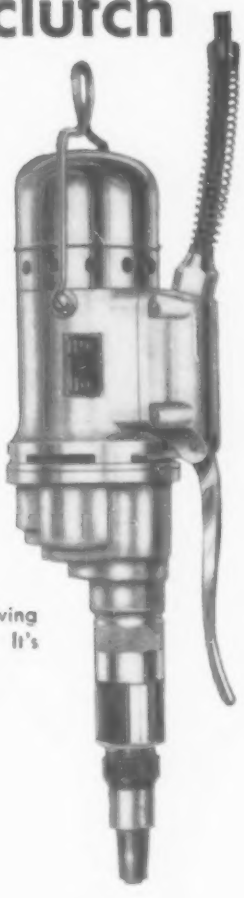
The real test of a coolant pump is how well it does its job on your metal-working machines. Here Ruthman Gusher Pumps show their outstanding superiority. You get instant Coolant flow—there is no lag between the start of the machine and the delivery of coolant.

See for yourself the superiority of Ruthman Gusher Coolant Pumps by specifying them on your new equipment. Write for our new catalog today.

THE RUTHMAN MACHINERY CO.

1810 Reading Rd. Cincinnati, Ohio

Only MILLERS FALLS screw drivers have the ADJUSTOMATIC clutch



We'd like to see a screw driving problem No. 50 can't solve. It's compact, light, and powerful.

WHAT IT MEANS TO YOU

If you have the problem of getting smoother, faster, more uniform production screw driving . . . then Millers Falls portable electric screw drivers will pay off for you in *results*.

You can solve your problem with a Millers Falls screw driver, because only Millers Falls gives you the patented, super-sensitive "Adjustomatic" clutch.

WHAT THE ADJUSTOMATIC CLUTCH DOES

Gives velvet smooth, vibrationless operation even on assemblies usually considered too delicate for a power driver. So sensitive it delivers the *right* torque for screws from No. 10 down to No. 2. Lengthens the useful life of the tool. Increases assembly and production efficiency and speed, cuts costs.

More powerful than ever, the new "Dyno-Mite®" line has no equal in its field.

The two Millers Falls screw drivers illustrated are doing remarkable jobs in many plants . . . not only because of the "Adjustomatic" clutch but also because of other unique features which help workers drive more screws faster and better. Both are available in a number of capacities and speeds.

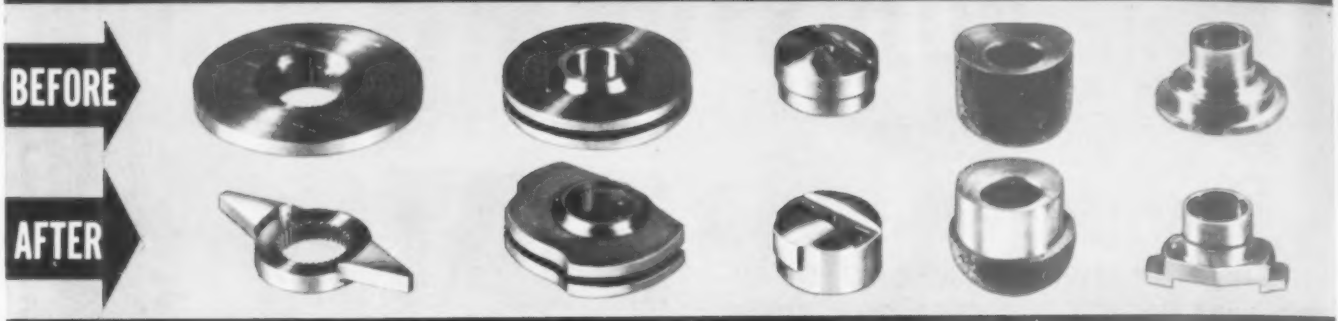
Portable Electric Tools

MILLERS FALLS TOOLS

SINCE 1868

Solve your screw driving problems now. Write for full information and the name of your nearest Millers Falls distributor. He can help you. Millers Falls Company, Greenfield, Mass.

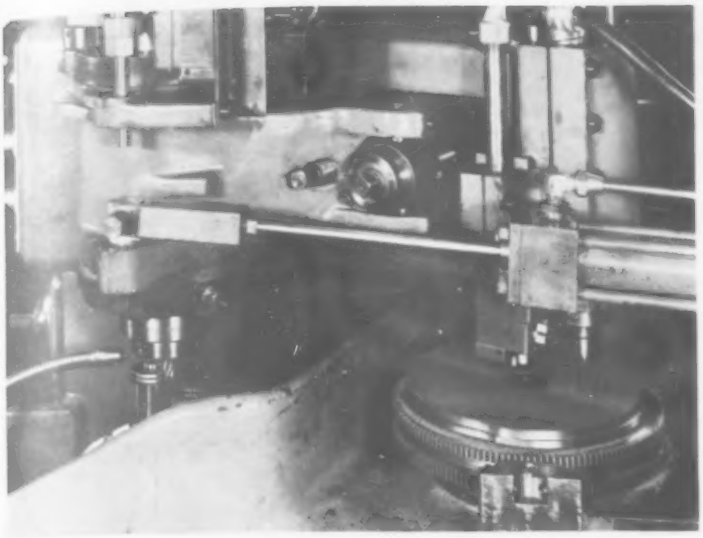
If Your Production Requires Milling Intricate Parts Like These



You Need the New Sundstrand *Cam-Controlled* Contour Milling Machine

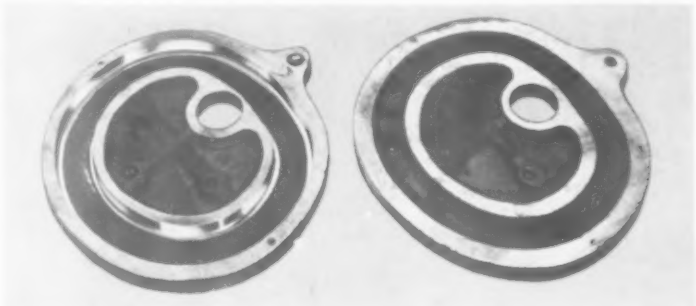
SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.

RIGIDMILS • FLUID-SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT



Mills Both External and Internal Cams

Yes, you'll find this new Sundstrand contour milling machine adaptable to an endless variety of milling operations on irregular shaped parts. It's a single vertical spindle cam-controlled, hydraulically operated milling machine. Both internal and external contours can be milled quickly and accurately on parts of 5" diameter or less. Machine adjustments can be quickly and easily made for over 24 different cycle combinations. The ¾ HP adjustable speed spindle motor has ample power and speed range for the size of work for which the machine is intended. Since one operator can easily attend several machines, cams of various shapes can be produced at a savings on a production basis. Illustrated below is a good example of internal contour milling. Typical examples of other external contour milling operations are illustrated on the opposite page. Sewing machine, gun, governor, business machine and many other small parts can be handled on this versatile machine.



Mills Master Cams

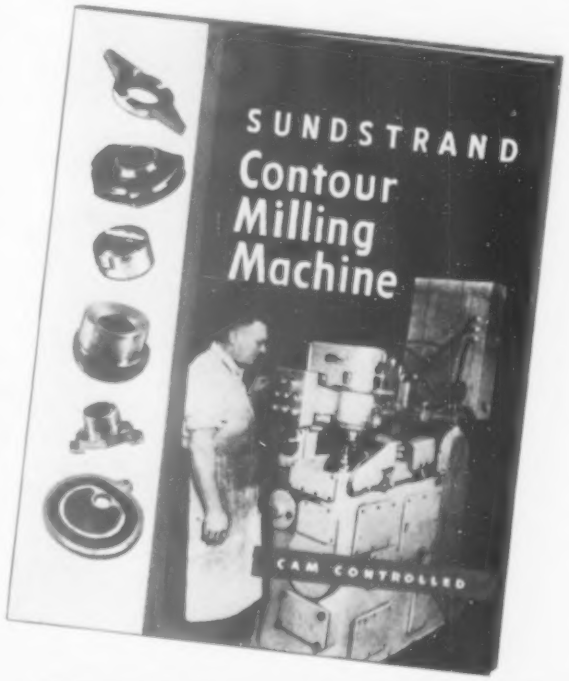
You will save many hours of engineering intricate cam profiles with this machine. Through the substitution of a cam-cutting spindle to replace the cam roller spindle, the machine operating procedure can be reversed to produce cams by merely following the sample part which is clamped in the fixture on the machine table.

Simple to Operate

In spite of the complex work performed by this machine, it is amazingly simple to operate. It is completely automatic, yet easy to set-up for the different jobs. This simplicity of operation makes it possible for one man to handle several machines without sacrifice of accuracy or production.

Write for Complete Data

This new 6-page folder contains complete information and specifications of this production contour milling machine. More detailed description covering the 24 automatic cycles and how easily they can be set-up to handle the milling of a wide variety of contours is included. If your work includes milling intricate contours on a production basis, get this bulletin on the new Sundstrand cam-controlled milling machine. It's FREE. Ask for Bulletin No. 783.



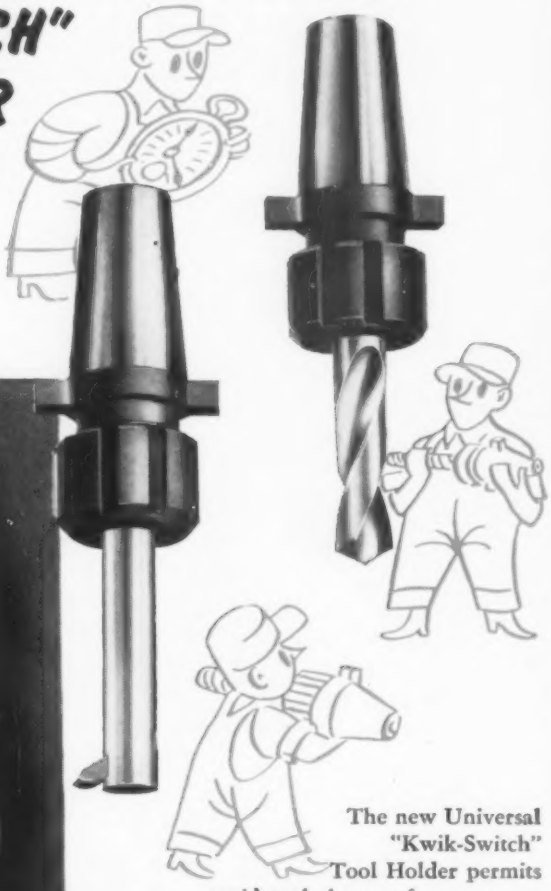
SUNDSTRAND MACHINE TOOL CO. · ROCKFORD ILLINOIS U.S.A.

SUNDSTRAND
MACHINE TOOL COMPANY
2540 **Eleventh St.** • **Rockford, Ill., U.S.A.**

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

NEW INGENIOUS UNIVERSAL "KWIK-SWITCH" TOOL HOLDER

permits 10-second tool changes without accuracy losses

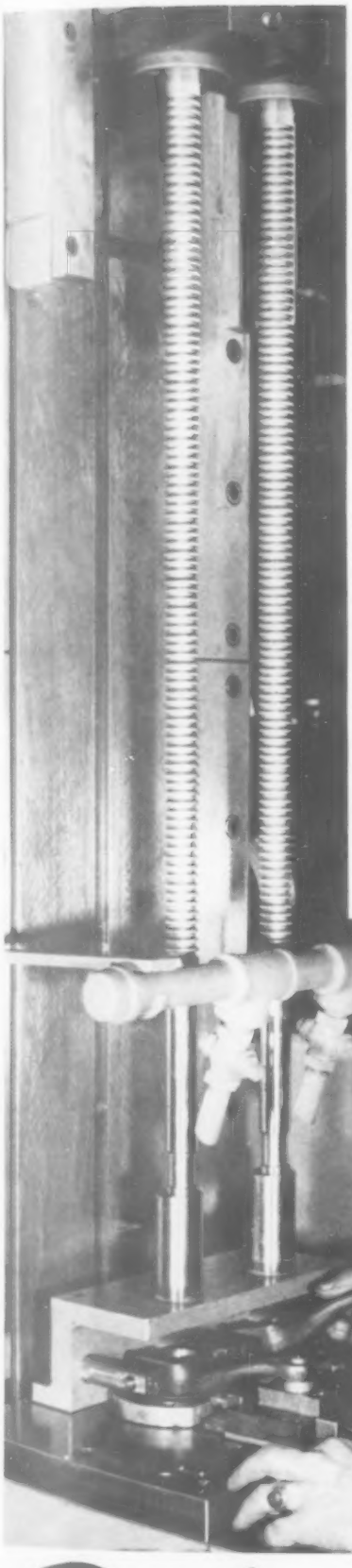


The new Universal "Kwik-Switch" Tool Holder permits rapid tool changes for many operations, such as drilling, reaming, and boring on mills, radial drills, and other machines and still maintains accuracy and rigidity not ordinarily found in tools of this type. The Universal "Kwik-Switch" Tool Holder consists of a Master Chuck and several Adapter Chucks. Each tool is inserted in its Adapter Chuck and set to proper length and tightened. The Adapter Chuck is then easily locked or unlocked by hand in the Master Chuck by less than a half turn of the locking nut. Tools are thus interchanged in a fraction of the time ordinarily required in similar operations. Precision manufacture throughout insures the accuracy of the "Kwik-Switch" Tool Holder. It is made of hardened and ground steel and held to the same exacting standards which have made the Universal Collet Chuck a favorite of industry. Universal "Kwik-Switch" Tool Holders handle tools with either straight or taper shanks. The Master Chuck is available in straight and taper shanks to fit all standard machine tools. Send for complete information.

UNIVERSAL ENGINEERING COMPANY
FRANKENMUTH 3, MICHIGAN

Facilities available for special hardened and ground precision parts made to customer specifications.

OTHER UNIVERSAL PRODUCTION TOOLS



THE *American* WAY...

TO PUT "TEETH" IN STEERING ARMS

FASTER . . . AT LOWER COST

Two station fixture on a standard American broaching machine enables this manufacturer to broach 10 serrations in a segment of the steering arm hole and finish broach the hole in one pass. Location of the 10 serrations are maintained by index flats on the broach shanks. An economical, high-production rate of over 250 per hour was attained on an American T-10-36 vertical hydraulic broaching machine, with hydraulically operated, manually controlled broach retriever . . . arranged for two station pull-down broaching. The fixture holds one part at each station completing two parts at each stroke of the ram. Two hand manual control assures absolute operator safety.

Versatile Three-way Machines Achieve Overall Economy

Economical, high-production rates are easily attained on American type T, three-way broaching machines. Designed for inexpensive adaptation to push, pull or surface broaching, with single or multiple tooling of the ram, these three-way machines provide for low-cost conversion as production requirements change. American Engineers will be glad to make their recommendations for your broaching production. Write giving hourly requirements and part sample or drawing. Circular 100 gives full information on three-way machines. Address Dept. M.

AMERICAN *American* BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

See *American* First—for the Best in Broaching Tools, Broaching Machines, Special Machinery

Accuracy...

. . . comes naturally to L & I Reamers. It's the way they're *built* that does it. First, bar stock — the finest obtainable — is thoroughly heat-treated, evenly hardened. Then L & I grinders go to work cutting keen, true-line edges. Every flute is ground — not milled — for better chip slippage. And grinding from a pre-heated bar gives you reamers with closer dimension control, sharper cutting edges, longer production life.

L&I *Reamers* GROUND FROM THE SOLID

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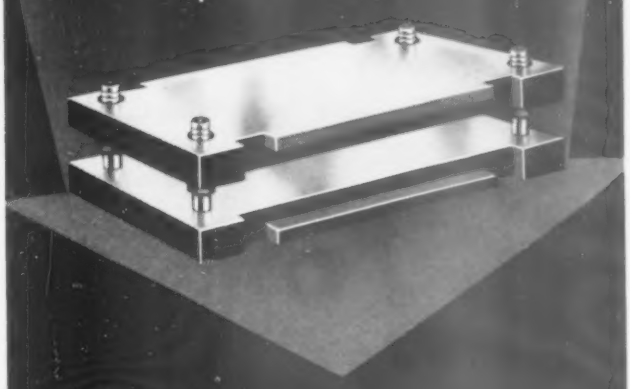

Our production facilities are employed *exclusively* in the design and fabrication of standard and special steel and semi-steel die sets. "DETROIT" specialization guarantees dependable, prompt service and workmanship of the highest quality on both standard and special jobs. "DETROIT" die sets are Micrometric machined to assure long die life and consistently satisfactory operation.

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DETROIT DIE SETS ★

Get Increased Cutting Efficiency

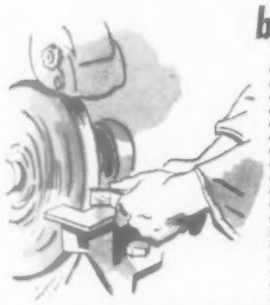
by grinding HAYNES STELLITE tools properly

Trade-Mark

To get best results with HAYNES STELLITE metal-cutting tools, they should be sharpened correctly, so that they have (1) smooth cutting edges, (2) correct clearance angles, and (3) no heat checks. These tools, which are designed for heavy cuts at high speeds and long life between grinds, can be readily reground as required, using standard grinding wheels and grinding methods. Here are a few practical suggestions that can be carried out with the grinding equipment in the average tool room.

For grinding wheel recommendations and other information, write to the nearest district office listed below and request a copy of the booklet, "HAYNES STELLITE Metal-Cutting Tools," Form 5401.

by Hand...

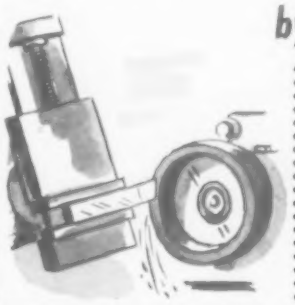


1. Grind the tool on a sharp, free-cutting wheel. Use firm and positive pressure. Keep the tool moving across the wheel face to avoid excessive localized heating and the possible checking of the cutting edge.

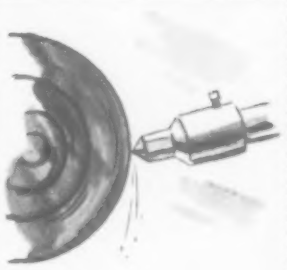
2. Do not dip the tool in water during grinding. Rapid chilling of the hot edge may cause surface checking.

3. Lap or hand stone the cutting edges after grinding to improve their efficiency.

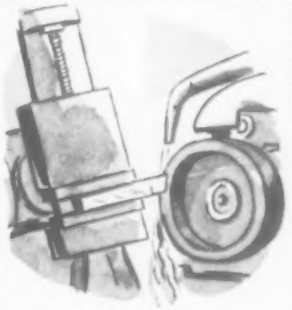
by Machine...



1. Use soft wheels, slow speeds, and rapid traverse. When grinding dry, take light cuts to avoid overheating and checking the work.



2. Dress the wheel as often as necessary to keep it free cutting, because a glazed wheel will check the cutting edge and shorten tool life.



3. Use heavier cuts and faster speeds when grinding wet. Direct a liberal flow of coolant at low velocity to the point of grinding.

HAYNES alloys

TRADE-MARK

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They supply removable taper shanks for number, letter, and fractional drill sizes, and other small tools — #1 thru #7 Morse tapers, #7 thru #13 Brown & Sharpe Tapers, and A.S.A. .239, .299, .375, and 4½ tapers.

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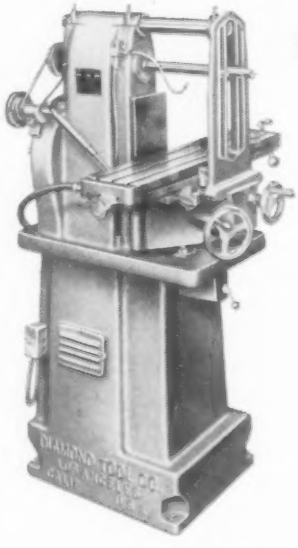

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Pacific Coast Plant Betters Production of Hot Water Tanks with FARQUHAR HYDRAULIC PRESS

NO production time has been lost for maintenance purposes since the day this 500-ton Farquhar metal-forming press was installed at the Seidelhuber Iron & Bronze Works, Seattle, Washington.

The Farquhar Press is used for forming heads for hot water storage tanks. Better production is obtained because there has been no machine "down-time" with the Farquhar Press on the job. Smoother operation and improved quality are obtained because Farquhar's hydraulic cushion eliminates wrinkling and tearing.

The Seidelhuber plant is only one of hundreds of users throughout industry who depend on Farquhar Hydraulic Presses for better production. In the shop or on the line, you get the benefits that Farquhar builds into every press: (1) Rapid advance and return of ram *for faster work*. (2) Extra length guides on moving platen *for greater accuracy*. (3) Finger-tip controls *for easy, smooth operation*. (4) Positive control of speed and pressure on the die *for longer die life*. Farquhar builds hydraulic production presses in all sizes and capacities for all types of industry.

Farquhar engineers are ready and willing to help solve whatever production problem you may have, with a hydraulic press that will do your job faster, better and cheaper. Why don't you give them a call?

Farquhar Hydraulic Press, *forming heads for hot water tanks. Nine gauge steel blank material (30" x 30") is used; head is 26" diameter. Only one man needed to place material in press.*

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HYDRAULIC PRESSES
for Bending - Forming - Forcing - Straightening - Hobbing - Assembling
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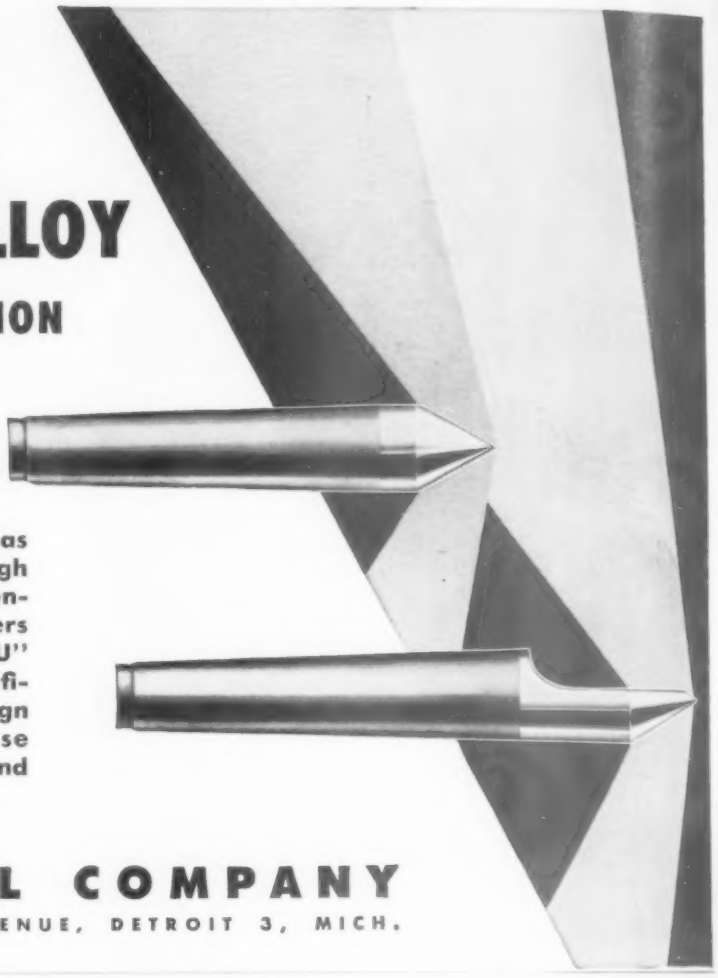
RESISTS WEAR AND ABRASION

3 to 10 times longer!



So superior is this alloy that *by actual test* it has shown results 3 to 10 times better than high speed steel and other alloy materials for centers. Standard "M-40-U" alloy tipped centers can be furnished from stock. Special "M-40-U" alloy centers can be furnished to your specifications, or our engineers will help you design special centers to fit your needs. Choose GORHAM "M-40-U" for top performance and long wear.

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Save Time! Boost Production! Speed up operations!—You can do it with this new electric valve that makes effortless, labor saving *push button* or *automatic control* SIMPLE . . . DEPENDABLE . . . and ECONOMICAL for a wide variety of applications where compressed air is used for power.

It's SIMPLE to use. Fits directly into air supply line. No relays or pilot lines needed. *Ideal* for remote control . . . interlock or sequence operation . . . building into equipment.

It's DEPENDABLE. Built to withstand hardest kind of service. Quiet disc type valve—positively air-tight; self-lapping. Pilot controlled; piston operated. Continuously rated solenoids. Capable of 180 cycles per minute, or more.

It's ECONOMICAL! Small and compact. 10 watt solenoids—low power requirements; only momentary contact needed. Simple electrical connections with plant wiring. Sizes ⅜", ½", and ¾". For any pressure from 25 to 150 p.s.i. *Complete information on request.* HANNIFIN CORPORATION, 1101 S. Kilbourn Ave., Chicago 24, Ill.

A New **HANNIFIN** *Product*

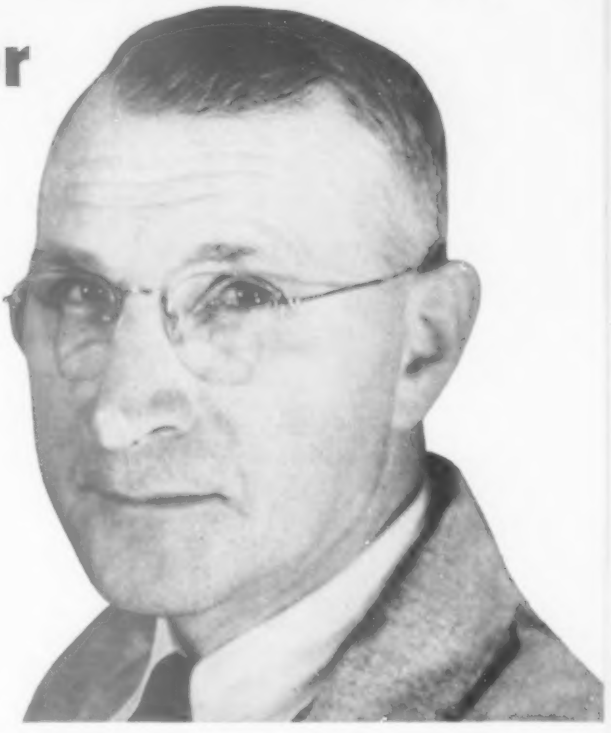
SEND FOR YOUR COPY OF NEW BULLETIN NO. 230

Bench Leader demonstrates new Lufkin "CHROME CLAD" Micrometer

with Non-Glare Satin Finish

•

E. J. Samel, veteran of the Packard Motor Car Company tool room, approves its easy-reading, rust and wear resistant features.



● Its satin finish absorbs light, prevents glare and eye-strain. Markings stand out sharp in any light. It is rust and wear resistant. Hardened ground thread, one-piece spindle, ease of adjustment and "rapid reading" (each thousandth numbered) are a few of the many desirable features of this great improved tool. Here's a real ally for the precision worker to whom accuracy is a must.

Designed to make accurate measurements easy for the operator. Heavy chrome plating with non-glare satin finish brings out markings sharply without eyestrain. You get readings at a glance in bright or poor light.

"See how throat depth and cutaway frame make entry possible in minimum clearance and enable easy measuring to maximum depth in narrow slots."

"It is well-balanced. Ratchet stop eliminates overpressure, gives more consistently accurate measurements — important when your 'feel' is off."

"Look—you can take it apart completely, even clean inside of thimble and thread. And the reading line keeps its original position permanently—directly in line of vision after adjusting for wear or lapping of anvil and spindle faces."

Seven Superior Features

•

"Chrome Clad", Non-Glare Satin Finish

•

Hardened Ground Thread

•

One-Piece Spindle

•

Micro-Lap, Mirror-Like Finish on Anvil and Spindle Ends

•

Cutaway Frame

•

Easy Adjustment

•

"Rapid Reading"

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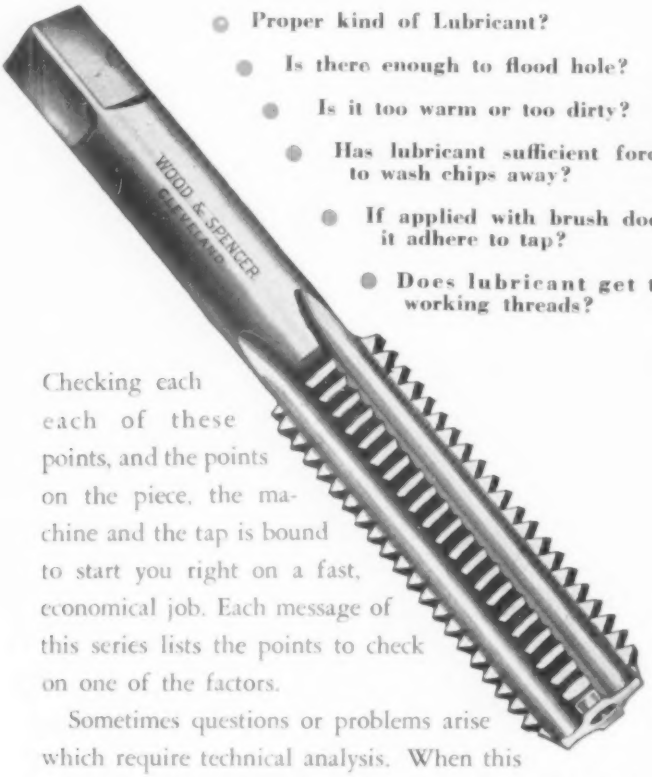
How to

TAPPING TROUBLES *before they start*

Trouble on routine tapping jobs can generally be avoided by a little attention before the job starts. Check each of four factors: the piece or material being tapped, the machine and fixtures, the lubrication and the tap itself. The following list includes the points to check on the lubrication.

CHECK LUBRICATION

- Proper kind of Lubricant?
- Is there enough to flood hole?
- Is it too warm or too dirty?
- Has lubricant sufficient force to wash chips away?
- If applied with brush does it adhere to tap?
- Does lubricant get to working threads?



Checking each each of these points, and the points on the piece, the machine and the tap is bound to start you right on a fast, economical job. Each message of this series lists the points to check on one of the factors.

Sometimes questions or problems arise which require technical analysis. When this occurs, send us complete data: material, depth and diameter of hole, is hole through or blind, type of lubricant being used. Our engineers will be glad to give you a complete analysis and technical recommendations. No obligation, of course.

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WITH

PROTECTRON

Protectron *prevents* costly tool and die breakage. Senses oversized or overhard stock, "pile-ups", and tool dullness. Automatically trips the machine at the slightest *mechanical* overload from whatever cause before damage occurs. Further: Protectron cuts costly down time and lengthens tool life up to 300%. New Protectron model covering all loads is now ready for delivery.

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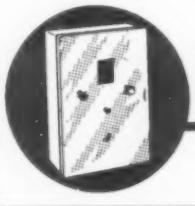

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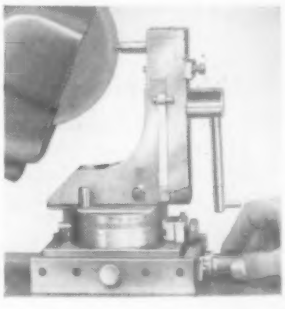
*Fluidmotion**

accurate form-dressing even by a beginner



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- Micrometer feed to wheel.
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have superior surface finish, uniform hardness and stability, yet are priced no higher than the lowest published prices (only $350 for 83-piece, "A" grade set). Packaged in the unique DoALL "Visual" case, compact and easy to use.

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give that famous service that you have always received on DoALL Bandsawing Machines and DoALL Precision Surface Grinders.

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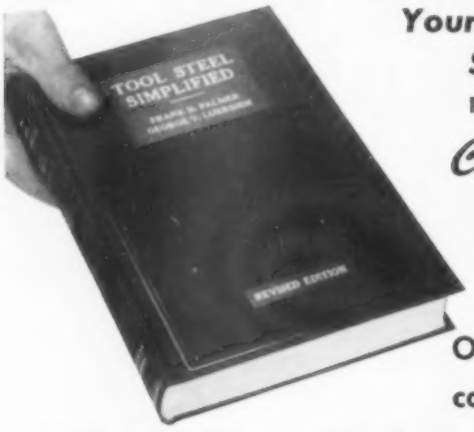
A 564-page authoritative handbook



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4. The Character of Tool Steel
5. The Soundness of Tool Steel

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6. The Matched Set Method
7. The Twelve Matched Tool Steels
8. The Matched Set Method in Use
9. The Tool Steel Selector

Part III—Properties, Heat Treatment and Testing of Tool Steel

10. Heat Treating Methods and Equipment
11. Hardness and Toughness Testing
12. Properties and Heat Treatment of Twelve Matched Tool Steels
13. High Speed and Hot Work Steels

Part IV—Things Worth Knowing

14. Relation of Design to Heat Treatment
15. The Hot Acid Etch Test
16. Timbre and Hardenability Tests
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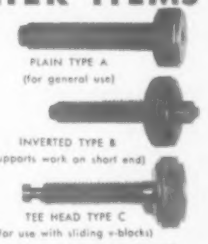
End pressures automatically limited, provides accurate holding tension. No work distortion, costly rejects, or expensive fixture rework. Individually boxed. 17 sizes offer various types and end pressures.



THE NEW ADJUSTABLE TORQUE THUMB SCREW

"SET YOUR OWN"

In response to industry's demand for a Torque Thumb Screw which tool engineers can set themselves to meet requirements of many jobs, the Vlier Adjustable Torque Thumb Screw, with its range of 5 to 50 lbs. end pressure, provides the answer to economical production where light or heavy tension is required.

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Mighty midgets of industry. Whenever positive accurate spring-tension plunger action is required on jigs, fixtures, and die work for maintaining just the right pressure, Vlier "unitized" spring plungers are accepted as the standard. Saves hours of labor.

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Since 1907, the name of Parker has been a part of the progress of the automobile industry.

In 1915, Parker introduced the basic principle of ball bearings in grinding manufacture—a major advance in grinding which was unknown at that time.

A few years later the Parker Ball Bearing was patented to meet high speed and precision requirements and has been in use ever since.

Further research and engineering development brought forth the well-known Parker Majestic External and Internal Grinding Machines, each machine representing a great advance in simplicity of operation and precision.

The latest tooling development of the company is the Parker Majestic No. 2 Surface Grinder that provides new accuracy and flexibility for small grinding operations.

These many products of Parker Majestic will continue to serve the great automotive industry in the future, keeping pace with its demands for speed, accuracy and dependability.

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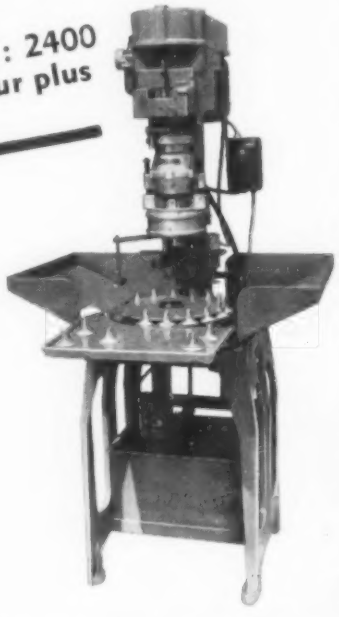
New Ettco-Emrick

ELECTRIC-AIR CONTROLLED TAPPING MACHINE GIVES RESULTS!

PART: Zinc die casting
OPERATION: Tap 5/8-16 hole in each casting
PRODUCTION: 2400 parts per hour plus



TWO big features make the new Ettco-Emrick Electric-Air Machine a must for any shop that does secondary tapping operations . . . (1) Versatility and (2) Speed.

The machine uses single and multiple spindle heads as well as adjustable spindle multiple heads. It takes only a few minutes to change head and workholder units to meet the needs of different jobs.

As for speed — the production on a typical job given above speaks for itself. Electric-air control is the answer. It provides full or semi-automatic operation — regulates depth of stroke — clamps work — operates work-holding fixture — ejects finished parts.

WRITE FOR FREE INFORMATION
and send sample part or drawing for quotation on production figures and complete tooling cost.

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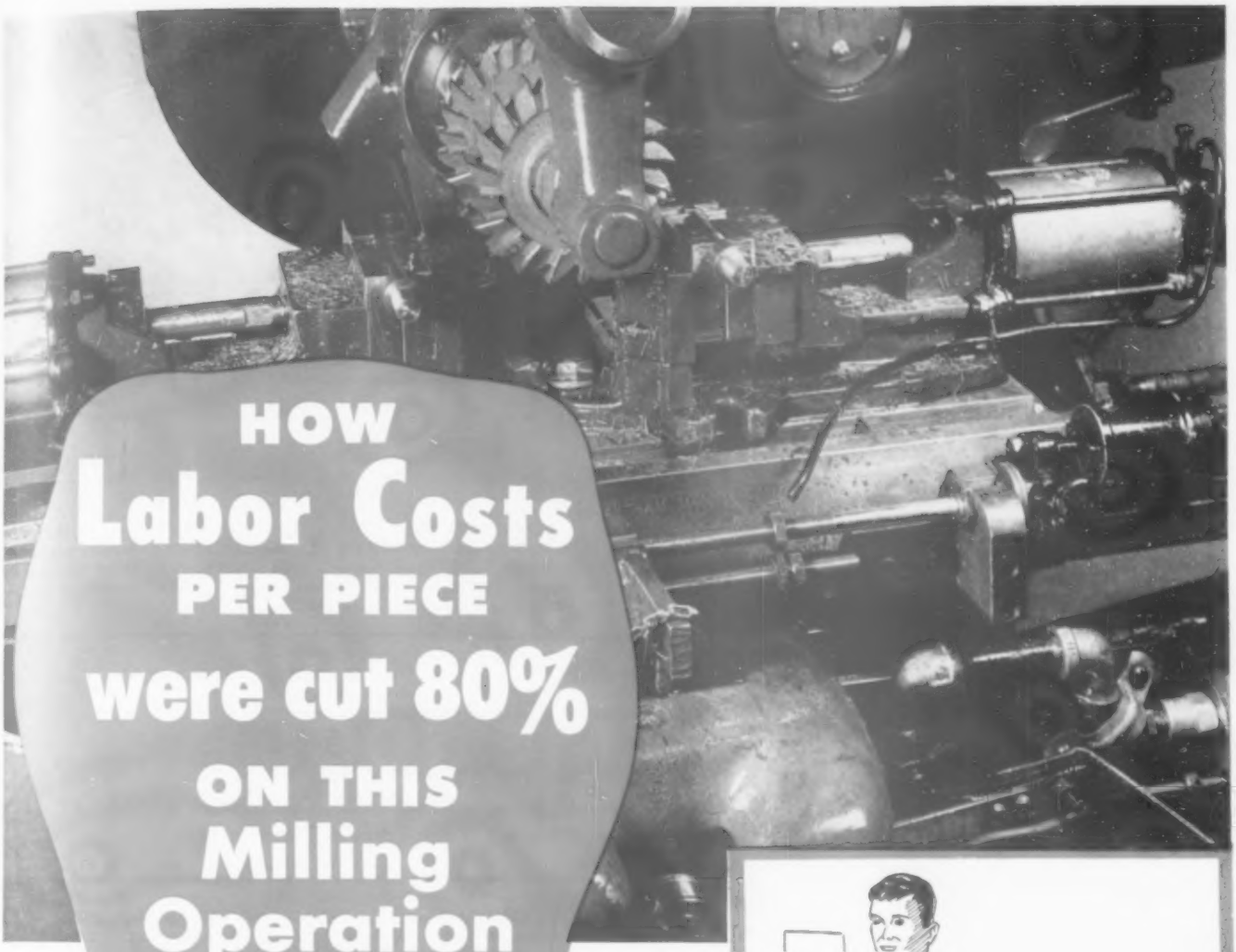

HOW Labor Costs PER PIECE were cut 80% ON THIS Milling Operation

THE cost of milling an anchor pin in this midwestern plant was running too high. The part was hand clamped and hand milled—one end at a time on a standard hand milling machine.

A Bellows Field Engineer suggested that the operation could be made simple and inexpensive with Bellows "Controlled-Air-Power" Devices.

A continuous action Bellows Air Motor was installed to traverse the table. Two Bellows Hydro-Checks served to control the table movement, assuring positive smoothness of feed and eliminating any back lash or chatter.

Bellows Air Vises were mounted on both ends of the table and were linked to the bed to open and close automatically.

As the unit now operates the operator loads one vise while the other is under the cutter. Once the unit is started all operations except loading and unloading are continuous and automatic.

The result: *Labor costs per piece were cut 80%; production jumped from 75 pieces per hour to over 400; cutter life was increased 600%.*

Such cost saving experiences are not unusual in plants using Bellows "Controlled-Air-Power" Devices. In fact, our case history files are filled with stories of cost savings accomplished with "Controlled-Air-Power". We'd like to send you our latest Foto Facts File Series. It's filled with ideas that can help you save money. No cost or obligation. Write: The Bellows Co., Dept. TE 549, Akron 9, Ohio.

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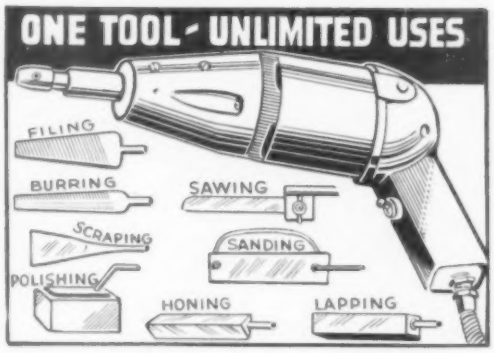

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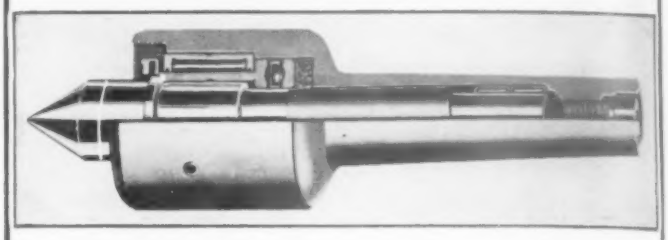

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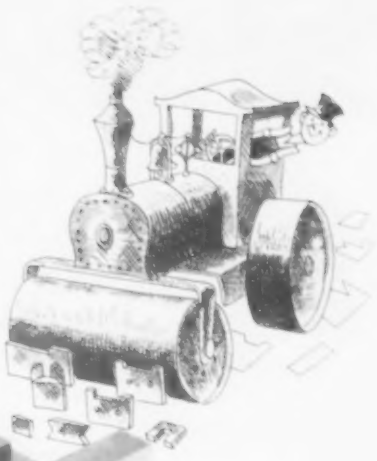

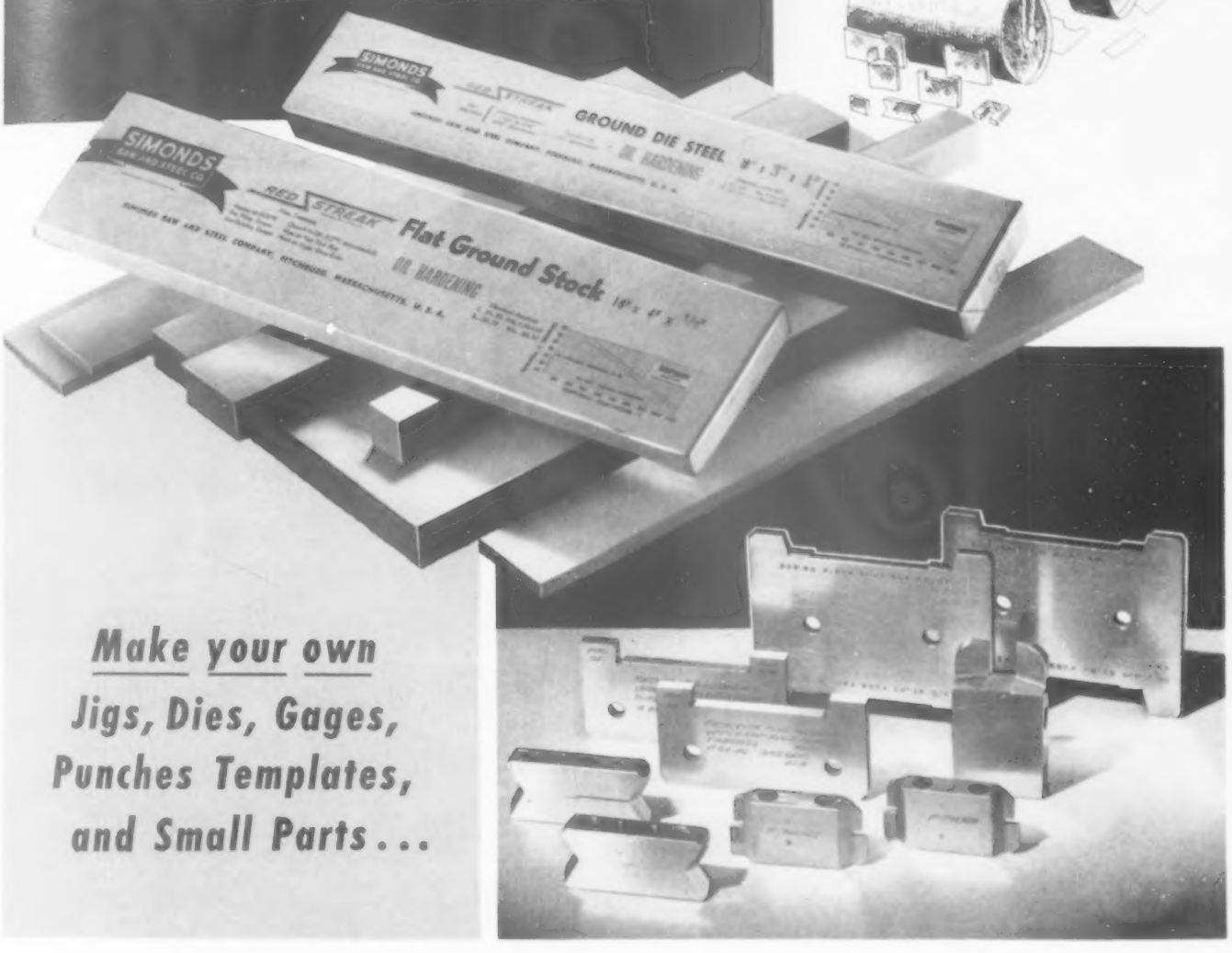

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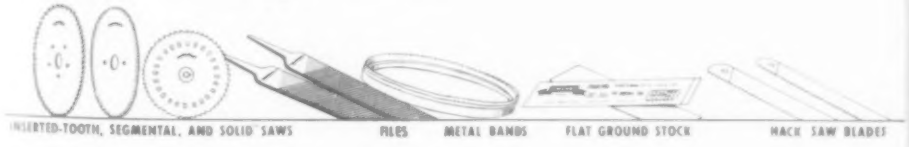

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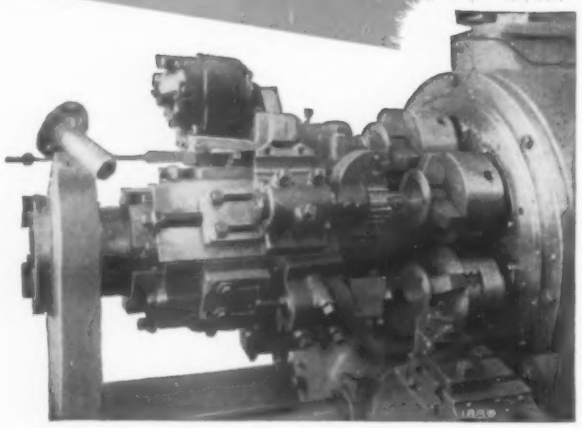

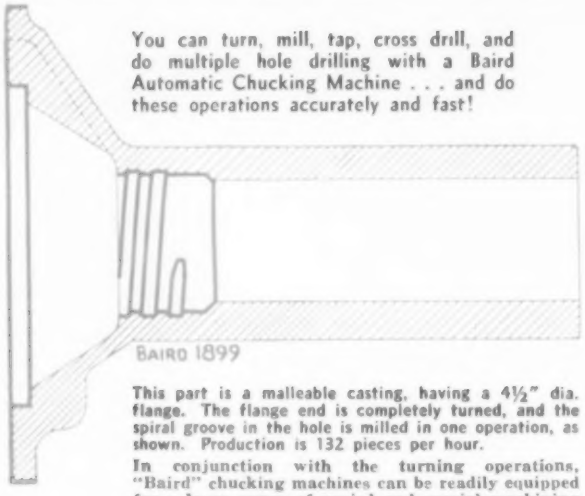

You can turn, mill, tap, cross drill, and do multiple hole drilling with a Baird Automatic Chucking Machine . . . and do these operations accurately and fast!

This part is a malleable casting, having a 4½" dia. flange. The flange end is completely turned, and the spiral groove in the hole is milled in one operation, as shown. Production is 132 pieces per hour.

In conjunction with the turning operations, "Baird" chucking machines can be readily equipped for a large range of varied and special machining operations: including Milling, Multiple Hole Drilling, Tapping, Cross Drilling, etc.

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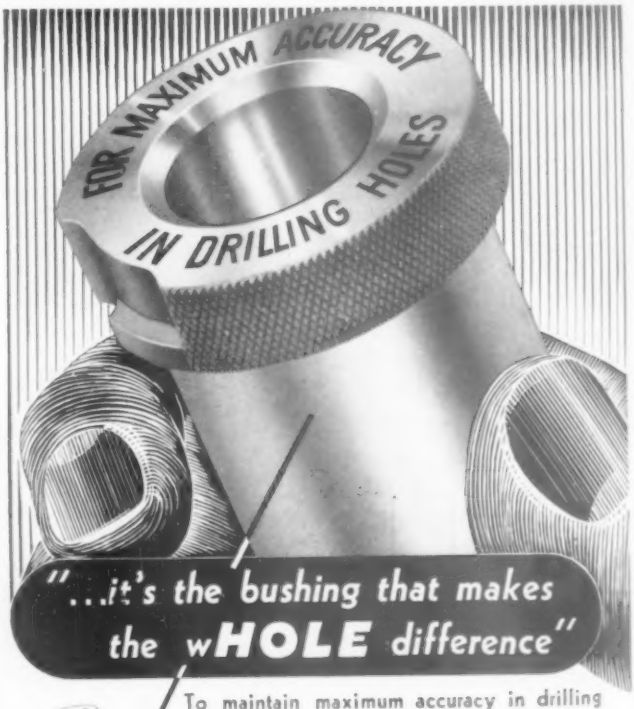
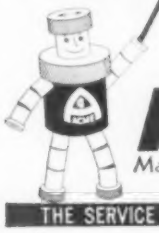


"...it's the bushing that makes the wHOLE difference"



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Call the nearest Bethlehem Tool Steel distributor or Bethlehem sales office. Prompt deliveries from local stocks.

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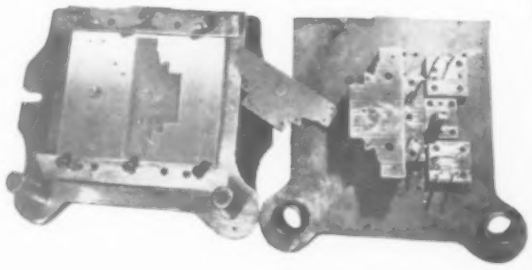
Anneal at 1450 F, furnace-cool, 202 Brinell
Harden at 1475 F, quench in oil
Temper from 325 to 400 F for a working hardness of 58 to 62, Rockwell C

AS AN EXAMPLE



. . . here's a blanking and piercing die—made from BTR—which produces end sections of 19-gage steel for fluorescent lamp fixtures. Its excellent wear-resistance is shown by the production of about 300,000 pieces between grinds. The dies will have a long life, for only 0.005 inch is removed when they are redressed, about three times a year.

Photo through courtesy of Westberg Tool and Manufacturing Co., Bridgeport, Conn.

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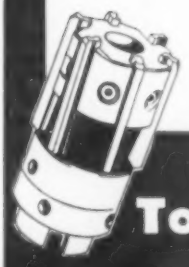

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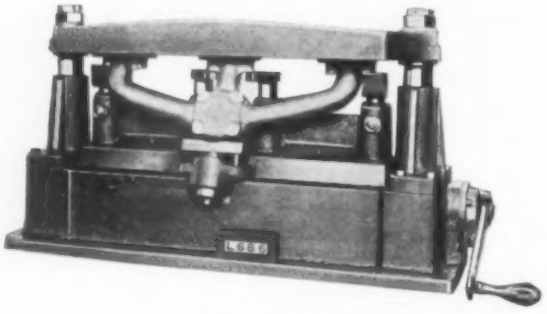

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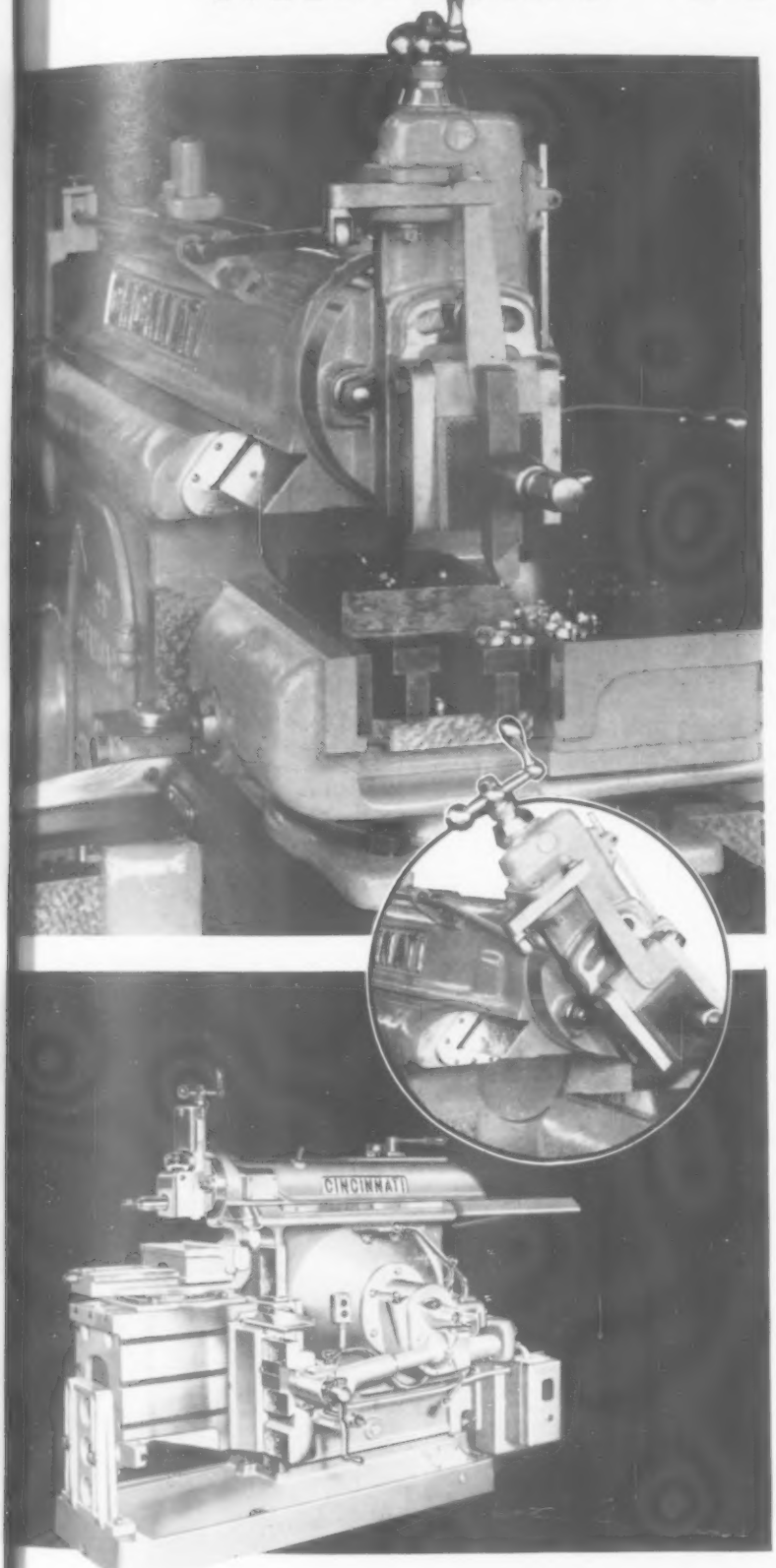

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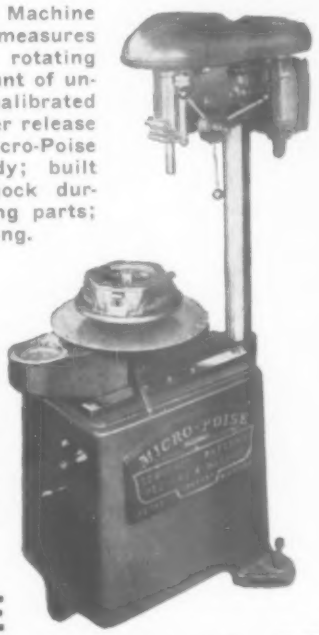

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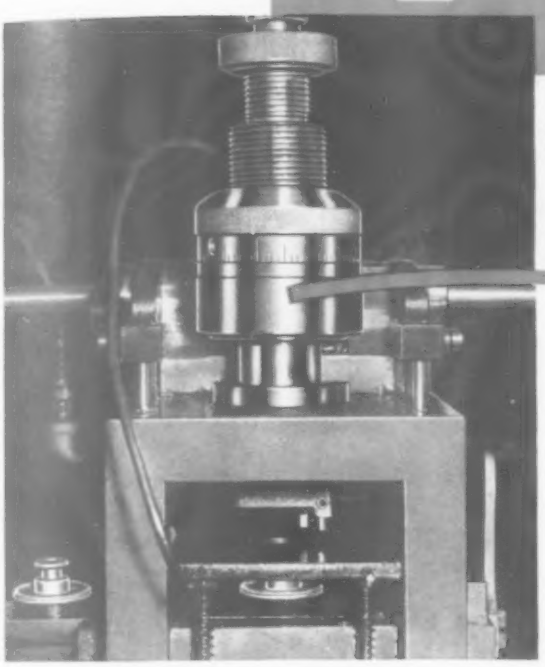

Scully-Jones Standard Type "J" Automatic Recessing Tool with special circular form cutter; being used at Grigsby-Allison Co., Inc., Arlington Heights, Ill. on a small Delta Drill press, to cut external groove on a zinc die cast clutch gear, at a rate of 300 per hour.

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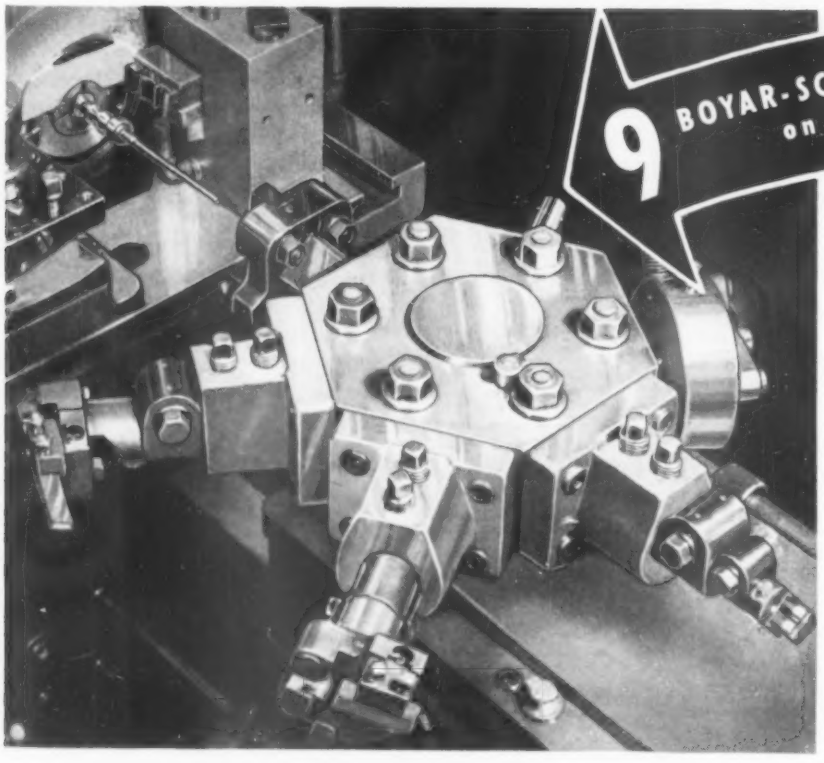

9 BOYAR-SCHULTZ SCREW MACHINE TOOLS on this turret lathe set-up

1	2RS Revolving Stop
1	3RT Turning Tool
2	2RT Turning Tool
1	ORR Roller Rest
4	Model H Precision Adapters
9	

This intricate stainless steel part, 7" in length, is blanked on a Warner-Swasey Turret Lathe. Skillful use of 9 Boyar-Schultz tools guarantees accuracy throughout following operations: feed out stock; box tool long diameter; box tool step diameter; box tool diameter of collar; form profile the knob using roller rest on small diameter for rigidity; center drill.

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TOOL ENGINEERS

who want additional production capacity always specify

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The Wisdom of Tooling
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R and L Tools, Inc.

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- ✓ Absolute Control of Thread Form
- ✓ Less Drive Power Needed
- ✓ Positive Control of Pitch Diameter

BESLY TAPS

UNSURPASSED ACCURACY

at *all* vital points

Microcentric CHAMFER
Micro finish, concentric to tenths of thousandths. Cuts freely and to size without burring or welding.

Solid Ground THREAD FORM
For angle and lead accuracy, elimination of gauging problems and control of pitch diameter to tenths of thousandths. Ground from the solid.

"Right" ROCKWELL
Taps pre-inspected for correct Rockwell hardness.

Mirror Finish FLUTES
Correctly designed to provide freer chip flow and longer tap life.

Tru-Square DRIVER
Square and shank fit correctly in chucks and holders, no wobble to cause oversize holes.

Just try this new Besly "FORTY-NINER" on a tough tapping job! See how thread follows through for perfect tapping results. That's because it's ground from the solid to a high degree of accuracy. Then, check these other points of thread superiority:

Accurate THREAD FORM—Absolute control of angles and lead eliminates gauging problems.

Superfine FINISH—High polish; less power required to drive the tap.

Consistent Precision in SIZE—Pitch diameter controlled to tenths of thousandth—tap to tap.

The Besly "FORTY-NINER" is produced by new manufacturing techniques and new machinery—much of which is *exclusive* with Besly. See for yourself what this can mean in better tapping and marked production savings. Ask your Besly distributor for a performance test in your plant now.

BESLY'S "HELPING HAND" HAS 5 STRONG FINGERS

- **Fast Delivery**
  —24 hrs. on high speed specials from hardened blanks;
  —3 weeks on bar stock specials.
- **A Complete Line**
- **Top Tap Quality**
- **Engineering Counsel**
- **Qualified Distributors**

THIS TRADE MARK IDENTIFIES THE WORLD'S MOST ACCURATE TAP

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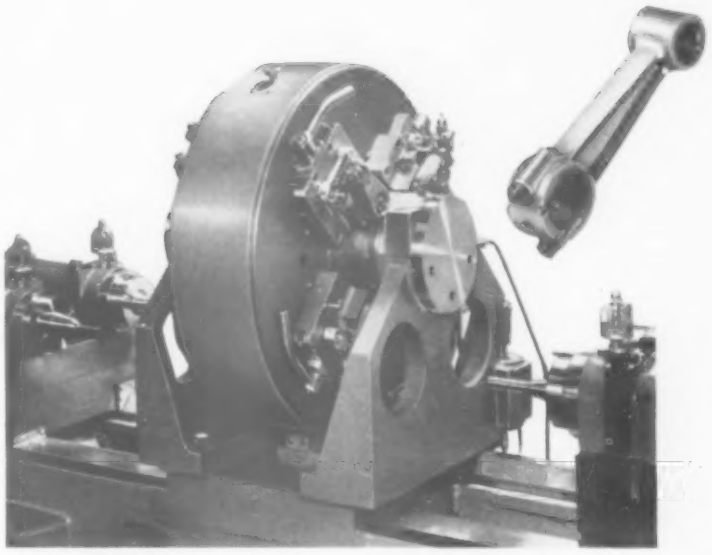
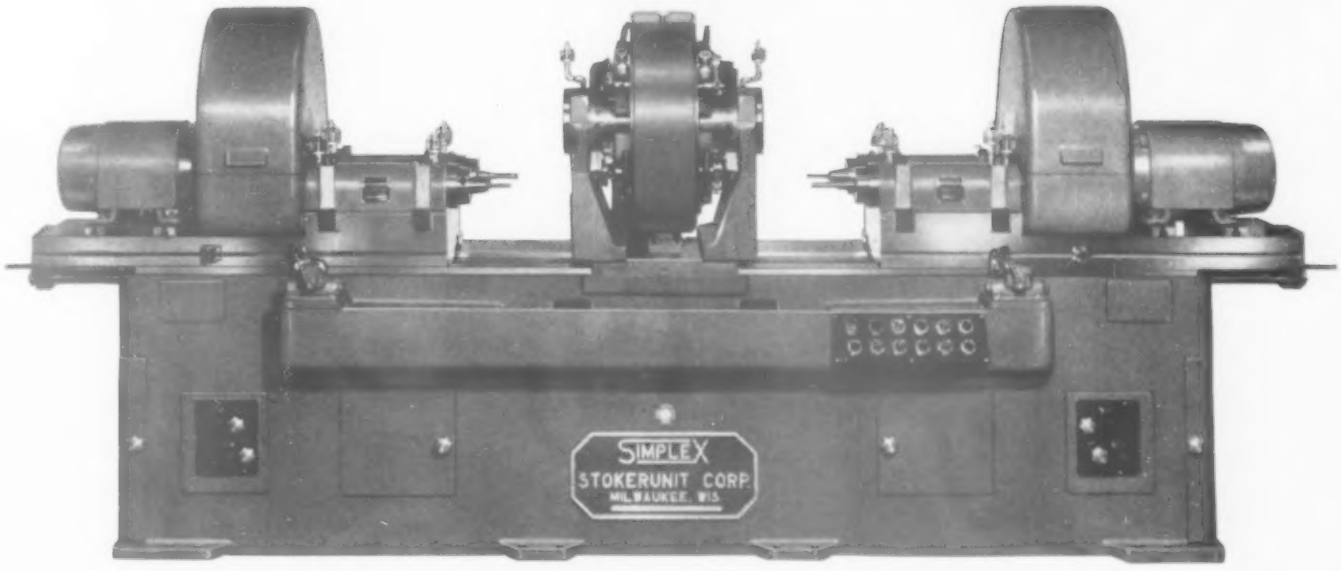
Small high speed gas engines run at speeds unbelievable a few years ago yet with mechanical failures rare due to the increasingly high standard of workmanship on the running parts, but costs must be reduced to reach the volume market. SIMPLEX Precision Boring Machines with SIMPLEX engineered tooling are used for this purpose by many leading manufacturers.





This SIMPLEX 2U 2-way Precision Boring Machine with double-faced automatic indexing trunnion fixture is tooled for semi-finish and finish boring small die cast aluminum connecting rods with bronze inserts. Boring tolerances are plus .0003, minus .0000. Interchangeable fixtures are provided so that several different size rods can be run on one machine. This principle is applicable to many size rods where maximum production and accuracy at low unit cost are required.

Precision Boring Machines

STOKERUNIT CORPORATION

SIMPLEX Machine Tools Division

4528 West Mitchell Street, Milwaukee 14, Wisconsin

Precision Boring Machines, Planer Type Milling Machines and Special Machine Tools

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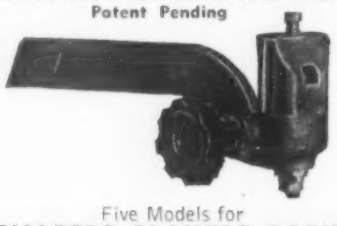

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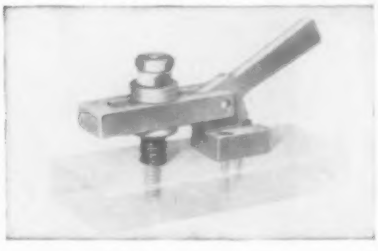

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Gear errors **and** Gear noise

should be discovered long before the gears reach final assembly . . .

There is a profit in scrap for the scrap dealer, but most certainly not for the gear manufacturer who suddenly discovers that an entire lot of gears have to be scrapped because they fail to meet tolerance requirements or because they are too noisy.

If economy is important in your plant, the time to find out about machining errors is right at the machine which causes the trouble—not after all the subsequent operations including heat treatment have been completed and the gears assembled in some power unit.

The best insurance against high cost of scrap gears is the use of gear checking machines right down there in the plant where the gears are being produced and where they can be checked periodically by the machine operators.

The Red Ring Gear Checker quickly reveals any dimensional errors and the Red Ring Gear Sound Tester immediately puts an accusing finger on noisy gears. Both machines have laboratory accuracy, they can be used anywhere in the plant or inspection department and they prevent a great deal of waste.

Get all the details by writing for Descriptive Bulletins.

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GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING
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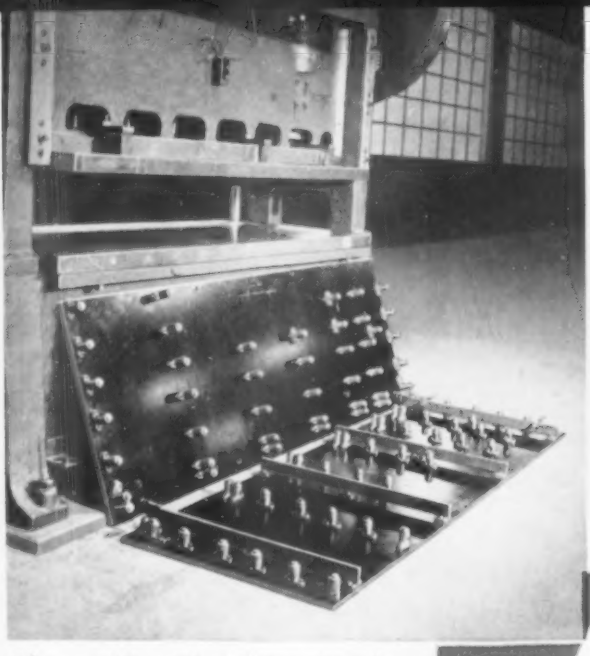
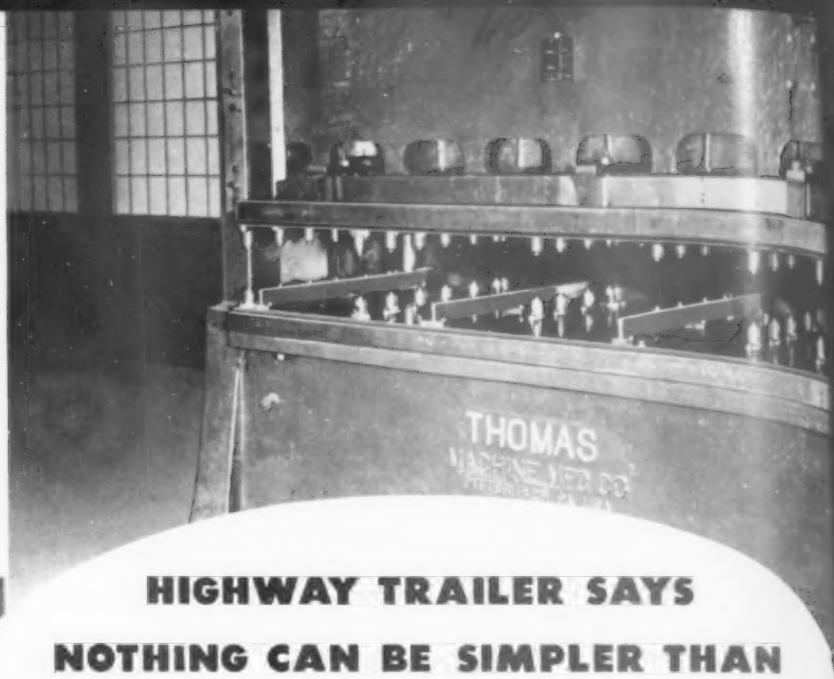
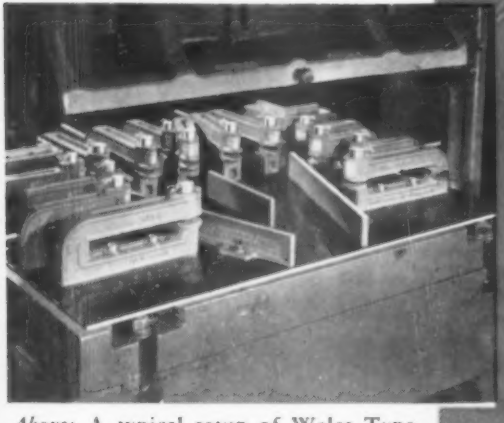
WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT





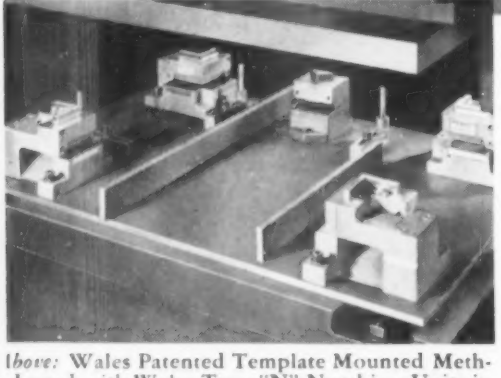
The two illustrations above show how HIGHWAY TRAILER uses Wales Type "CD" Hole Punching Units on Wales Patented Mounting Templates. These photos show the setup in and out of the press.

HIGHWAY TRAILER SAYS NOTHING CAN BE SIMPLER THAN THE WALES PATENTED TEMPLATE MOUNTING METHOD



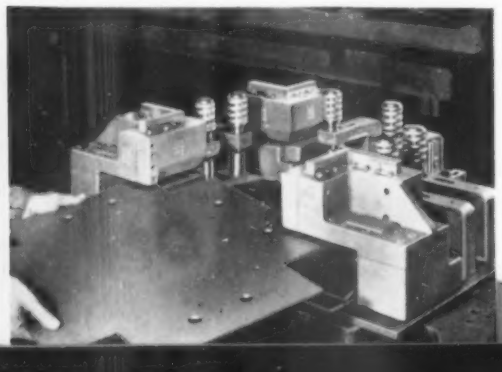
Above: A typical setup of Wales Type "BL" Hole Punching Units on a template for punching up to 1/8" thick mild steel.

WITH WALES HOLE PUNCHING EQUIPMENT



Above: Wales Patented Template Mounted Method used with Wales Type "N" Notching Units in stamping press.

Below: A combination setup on a template of Wales Type "CJ" Hole Punching and Type "NJ" Notching Units for punching and notching up to 1/4" thick mild steel.



● Highway Trailer, Stoughton, Wisconsin have found that the combination of Wales Equipment, mounted by the Wales Template Method, is the simplest, easiest, quickest and most economical way to fabricate many of their parts. Consequently, Highway Trailer standardizes on Wales Equipment.

TAKE THIS VALUABLE TIP. If you are punching holes, or notching angles, channels, extrusions or sheets in stamping presses or press brakes, investigate and compare Wales Equipment with any other method. You, too, will standardize on Wales Equipment because *no other hole punching and notching equipment compares with it.*

IT IS TOO BIG A STORY TO TELL ON THIS PAGE . . . so write TODAY for fully-illustrated, functionally colored catalogs.

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Wales Service Engineers are specialists in hole punching notching, selling no other line of equipment. Many of these vice Engineers have had several years' experience in the neering and production departments.

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